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Small, Economically-Operated Gravel Plants

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Present Tendency Points in that Direction; May Learn Something from Recent British Practice as Exemplified in the South of England

THOSE WHO have read descriptions of gravel plants in this country or have seen such plants during visits to England have no doubt wondered why they are of such small proportions as compared with many of those in the United States. In what follows the writer will try to explain the reason for this apparent lack of enterprise and will also describe the methods used over here and their differences from American practice. One reason for this difference is that the deposits in this country very rarely exceed 25 ft. in depth. Occasionally one hears of a 60-ft. face, but in the Thames valley, where there are some hundreds of pits, the average depth is about 17 ft.

The deposits in this area are of good quality, consisting mainly of flints and sand, brought down by glaciers during the ice age and deposited by the Thames when it was swollen by the glacial streams to many times its present size. Such an excellent, though shallow, deposit near London has helped considerably to increase the use of concrete in and around London. The result has been that since the war, gravel pits have not only increased in size but have probably quadrupled in number.

The ground now occupied by these pits was formerly market garden land, which has a much higher value than farm land because of its proximity to London and because of its possibilities as valuable building sites. The price of this land varies from £1000 to £100 per acre, according to location, and its average price is about £250 per acre. As a rule it comes into the market in small plots

Aerial view of gravel plant of Twickenham Gravel Co., near Hanworth, Middlesex

Pit of the Twickenham Gravel Co. at Edmonton, Middlesex

of 10 to 100 acres. Putting the average sized plot at 40 acres, and the average price at £250 per acre, the approximate investment in land will be £10,000, and the approximate gravel contents about 1,000,000 cu. yd. Normally one would not consider putting up a plant unless it had about ten years work ahead of it; therefore the average output of a gravel pit in this country is not likely to exceed 100,000 cu. yd. per annum, or 2000 cu. yd. per week.

Type of Material and Its Preparation

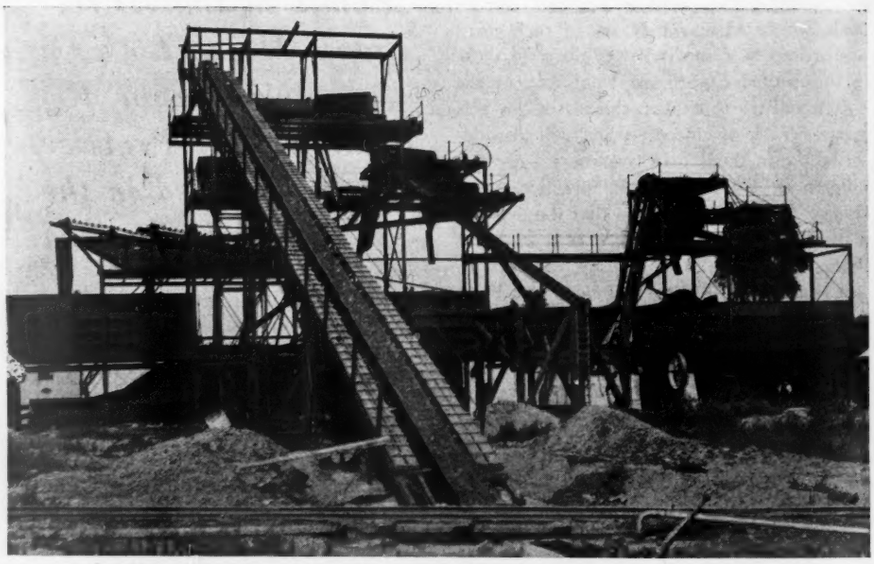
North and south of London, at Leighton Buzzard and Redhill, lie two deep seams of almost pure sand, which are believed to have been deposited by the sea long before the glacial age. These seams supply most of the soft sand and special sand markets, and are excavated chiefly by hand. The sea has graded the spoil into commercial sizes, and some of them, when dried and bagged for special jobs, fetch 10 shillings per cu. yd. at the plant. Others, used as mortar sand, fetch as little as 1sh. 6d. per cu. yd. East and west along the Thames valley and north along the Lee and Colne valleys lie the river gravels, lodged by glacial streams.

These gravels are mostly waterlogged, about half the deposit being above and half below water level. The bankrun consists of 35% sand, 35% ⅜- and ¾-in. shingle, and the balance of flints running up to about 6-in. cube. Perhaps about one stone per cu. yd. will not pass a 6- or 8-in. ring.

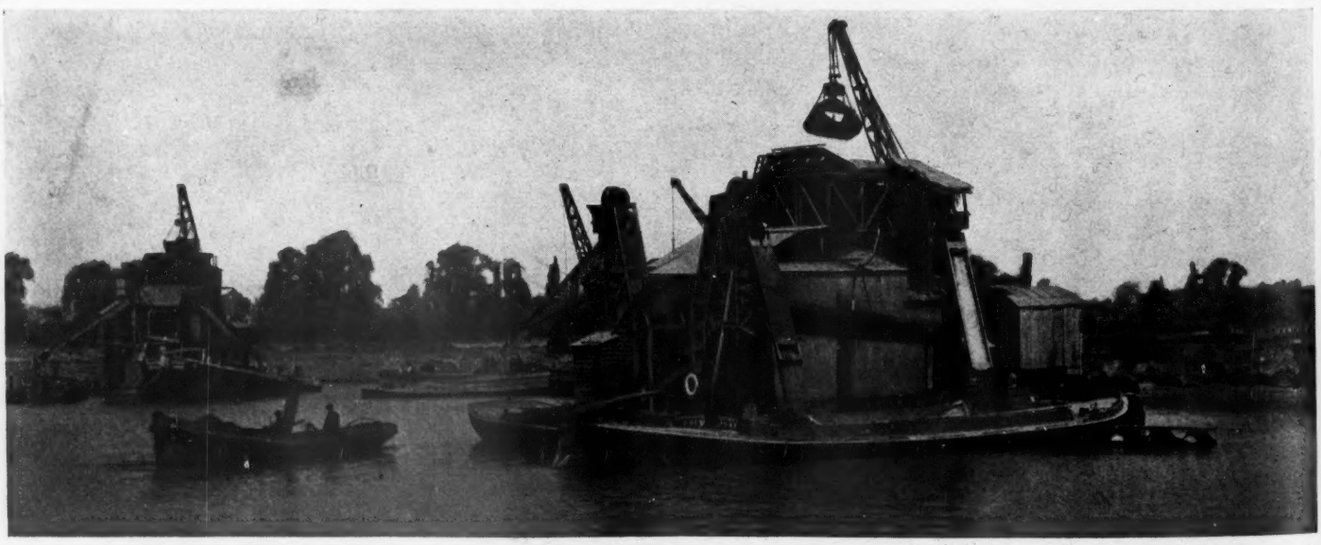
Sand finds a ready market for mortar, plaster, and concrete work; ¼-in. grit and ⅜-in. shingles, for roads; ¾-in. shingle for reinforced concrete; but 1½-in. shingle is less marketable and plus 1½-in. is practically never used now except for sewage filter beds.

Types of Plants

The oldest producer, whose family has been in the business for over a century, has



Gravel plant constructed by Goodwin Barsby; one of the largest plants in the Thames valley



Floating screening plant of the Ham River Grit Co., Ham, Surrey

Two views of Twickenham Gravel Co. operations showing 1-yd. Diesel engine dragline and centrifugal pump dredge

a string of a dozen or more pits surrounding London. In some of these an 8-in. pump is used, but in most of them floating dredges, fitted with grab-buckets which dump the material to grizzlies mounted on scows, are favored. The oversize is rejected into the pit and the remainder is floated to the screening point, where it is unloaded by grab-buckets, operated by derrick cranes which elevate the materials to the screens and crushing plant. The finished product is then loaded to truck or car by crane or overhead hoppers.

Two of the largest pits are owned by a public company, which works two of the finest and deepest deposits within 10 miles of Charing Cross, with an output of 12,000 cu. yd. per week. Here an entirely different system is used. At one pit the material is excavated by 1½-cu. yd. draglines loading cars which dump to underground hoppers; it is then elevated by chain-bucket elevators to be screened and crushed, and is then loaded into lorries by clamshell. At the other the complete process is done afloat, the gravel being excavated by clamshell grabs.

The most common type of excavator is the centrifugal pump, mounted on a pontoon and pumping through a pipe line to the screening and crushing plant, the pipe line being either supported on pontoons or laid on land, and more rarely discharging direct into barges alongside the dredge.

My company excavates by means of a Diesel dragline, loading 9-yd. saddle-back cars which carry the gravel to the screening plant. At one pit the material is dumped from the cars into the water and pumped to the primary screens and crushers, whence it is repumped to the secondary screens. I believe some American plants have recently adopted this scheme, but in this country I think my company stands practically alone in operating this system.

Dry pits usually employ power-shovels or draglines, unless the gravel can be dug by hand at under 4d. per cu. yd. In Yorkshire, where men can and do work when they want, hand methods are frequently employed; I understand a piece work rate of 3d. per cu. yd. is in force in some districts and the men earn good wages. At such a price, how could a power shovel justify itself?

Other methods such as hydraulic sluicing, scrapers, dipper dredges, and floating ladder dredges are not in evidence here. Power-drags and draglines are occasionally used but I have not heard of one that has been a great success. This may probably be due to lack of suitable deposits. One firm owning several pits uses ladder dredges mounted on rails with the screens and washing plant integral with the digger. The screening material is then hauled away to the stock piles or loading point. Personally, I prefer the screening to be done centrally and not on the excavator. If done on the excavator, a separate railroad track is required for each grade of material and the railway system is consequently too complicated. The origin of these plants is German and I understand they are extensively used on the continent.

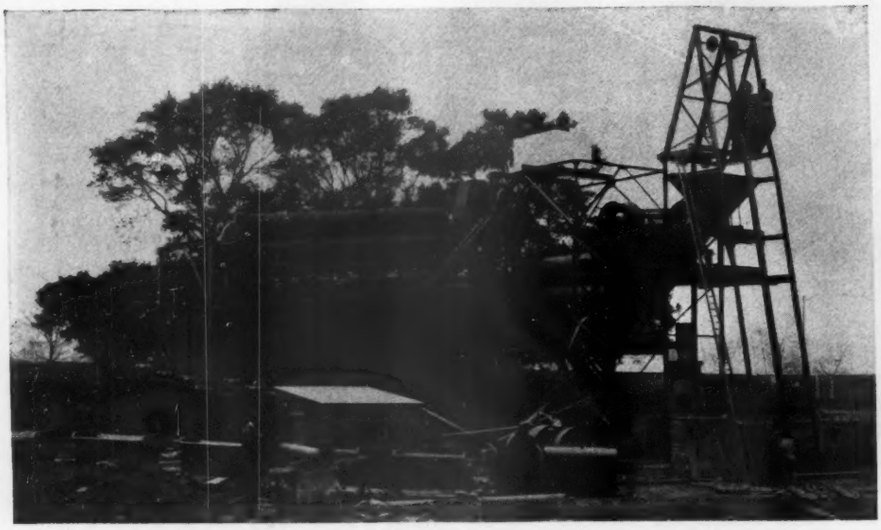
Excavating Equipment

Following are a few details of typical machines in use. Shovels and draglines are usually powered by petrol or Diesel engines. The types most commonly used are the No. 4 Ruston ½-yd. machine and the 1030 Ruston Bucyrus ¾-yd. machine. Until quite recently, steam was favored and many such machines of from ¾ to 1½ yd. capacity are still at work. But practically all new excavators have internal combustion engines.

Cranes operating grabs (clamshells) are still usually steam driven; ring-discharge single-rope grabs are most common, but these are rapidly being replaced by two rope machines. Electric cranes are seen occasionally and a crane with a petrol engine has recently been placed on the market.

When centrifugal pumps are used they are of 6 to 10 in. sizes with the 8 in. size pre-

Movable ladder-type excavators used in England; the one at the right having a rotary screen for sizing



Recent installation of four-stream rotary screen at William Cory and Son, Ltd., Dartford, Kent

dominating. Cutters are the exception, owing to the free running nature of the strata, combined with the smallness of the stones in the deposit.

In certain areas a very hard homogeneous deposit has been found which in almost every case was unexpected. The dredges were too small to accommodate cutter-gears, and in these instances draglines have been used to break down the bank for the pump to deal with. Electric motors are usually employed to drive the pumps, though occasionally Diesel, steam or petrol engines are found. As a general rule the suction pipes pass out direct from the pump inlet, through the side of the pontoon, and have a rotary joint followed by a right angle bend downwards. Attached to this bend is the suction pipe of steel tubing which is raised and lowered through the medium of the rotary joint. Very rarely is flexible tubing used on the suction side of the pump, though it is normally employed for the delivery line. Many plants, however, still adhere to ball and socket joints for the delivery line.

Screening Methods

For screening, a single rotary screen is chiefly favored, although every method, vibrating or rotary is used. We can show at least one advance over American practice in the Four Streams "Superfex" screen of J. and F. Pool., Ltd. As few readers have seen one at work, a description may be of interest.

The unique feature of this screen is that the material to be screened is fed into one mouth piece only, where it is equally divided into four separate streams and fed into four separate screen-cylinders rotating about a common center and supported on a single center shaft. The screening surface is almost double that of a single cylinder screen of the same length and diameter but the makers claim that in actual practice the screen has fully four-fold efficiency and output capacity. The reason for this is the tumbling action which takes place in a small diameter screen, displacing the fines from the top of the bed so that they pass through the screen plates, instead of riding on top of the coarser sizes.

Another feature is that the center-shaft upon which the four screen-cylinders are mounted is of such rigid construction that screens of any length up to about 50 ft. are entirely supported upon the two end bearings, reducing power and maintenance costs. The rigidity of this center shaft permits the screen-plates to be clipped on in a simple manner so that they may be changed in a fraction of the usual time; no holes are necessary as in screens where the plates themselves form part of the screen's support.

Dragline being used to excavate and feed hard-packed gravel to a pump dredge

Crushing Equipment

The crushers most commonly used are gyrating, jaw, rolls, and hammer types. The Symons cone crusher and other American inventions are however rapidly gaining favor. I believe the Ross chain feed for crushers was first used in England and is now being used in the United States. Washers are mainly of the rotary type, a few sand-drags are to be seen, but I have never heard of the use of a log washer. So little are log washers even thought of, that when we inquired the cost thereof from the London office of well-known American makers, they were astounded. "Did we mean a log-washer? Surely not! Perhaps a rotary screen, or a classifier but a log-washer—unheard of!" Classifiers are not much in favor. This is probably accounted for by the demand for "fines" formerly described.

In many pits loading is accomplished by clamshell but overhead loading hoppers are daily becoming more and more popular. Frequently the crane is a fixed or moving derrick, but more often 5- or 10-ton steam traveling cranes are favored.

The methods of elevating are legion. Belt conveyors, though used, seem to be less popular than in the United States. Batch-elevators are rare but chain bucket elevators flourish. This is probably because of the ease of incorporating them into any layout and the consequent saving of thought and calculation.

My firm has a double balanced batch elevator, which works continually without attendance other than greasing and adjustment of hoisting ropes. The hopper gates are opened and the skips filled to a predetermined weight. The gates are then closed, the hoist started, and at the top of the incline the skip is automatically tipped. Chains in the gate opening are used as feeders and to prevent any hanging up of the material. This method of elevating is eminently satisfactory but does not seem to be used elsewhere. The reason for this may possibly be the intricacy of design and rather high initial cost.

New Plants

Pittsburgh Plate Glass Co. and **American Cyanamid Co.** will complete as soon as possible, it is reported, their new alkali plant at Corpus Christi, Tex. Large quantities of lime are used in making soda ash and these two companies are large producers of lime at their other plants.

Adjusting a Re-Crusher to Give Maximum Percentage of a Desired Size

By Irving Warner,

Warner Co., Philadelphia, Penna.

THE ADVENT of the easily adjustable re-crusher has given crusher operators a certain degree of control of the percentages of their different sized products which they were quick to seize. It was quite obvious that the closer setting of the re-crusher gave more screenings and small sized stone, and vice versa, but what was not so obvious, and has therefore not been utilized, was the degree of precision necessary in the re-crusher adjustment to give the optimum results in the production of desired sizes and in the avoidance, so far as possible, of undesired sizes.

Therefore I believe that the results of experimental work and calculations made at the Cedar Hollow (Penn.) plant of the Warner Co. should prove of interest and value to crusher operators. It must be understood that while these tests and calculations apply to this particular plant, the methods employed should be readily adaptable to any plant making numerous sizes of crushed stone. The stone in this case was hard dolomite, but the method should be equally applicable to any rock that fractures normally.

Fig. 1 shows the flow sheet of the plant which presents nothing particularly unusual. The subject of this article is the adjustment of the Symons No. 3 cone crusher, which takes the tailings of the sizing screen all the time, and optionally takes the two largest sizes produced. The crushed product is recirculated in the usual manner.

The technic of the Cedar Hollow crusher plant is to make substantially stripped or straight sizes of stone into the bins. Grading specifications are met by proportioning the different sizes on a belt conveyor which runs the length of the bins and discharges to car or truck through a remixing chute. However, this system has no effect upon the mathematical methods herein presented. The operator is desirous of making a maximum quantity of a certain size for which there is a heavy demand, and avoiding so far as possible the production of sizes which might have to be stocked. Therefore, the calculations are based upon the grading of sizes as shipped, and for this purpose, I have taken for illustrative purposes the most usual sizes of the Pennsylvania State Highway Department, as shown in Table 1.

Crusher Adjustment

The first step is to sample and test the crushed product of the re-crusher for various adjustments of the crusher. In this connection, it must be noted that when taking the sample, the crusher must be set so that it is crushing substantially all of its feed. For the results will be erratic if any considerable portion of the feed is passing through the crusher without being crushed. Fig. 2 shows the grading of the crushed product for various settings of the No. 3 cone crusher at Cedar Hollow. These are given graphically on the arithmetic scale.

It is to be noted that the curves are substantially straight lines below the 80% line to the zero point, with a typical goose neck from 80% to 100%. The extent or variation in the goose neck has little bearing on our problem and may be largely ignored.

Sufficient accuracy is obtained, and the work facilitated by conventionalizing these curves to straight lines running from the zero point to the points of intersection between the 80% line and various test screen sizes as shown in Fig. 3. The goose neck tops above 80% are drawn in free hand. They are of small importance.

The interested operator can start at once with the curves of Fig. 3 without waiting to make the tests on the actual product of the crusher. For sometimes a re-crusher will keep a certain setting for weeks at a time, and it might take months to get a full set of tests for a full range of settings. Nor is it necessary to get these complete tests promptly. One or two tests are desirable to ascertain whether the nature of the rock and characteristics of the crusher are such as to give a reasonably straight-line grading below 80% passing. With this point settled, the calculations may proceed at once, and the checking of actual results may be done at convenience. If the goose neck tends to break away from the straight line below 80%, then a 70% base line may be used just as well, although with decreasing precision.

If the local conditions of the nature of the rock and characteristics of the re-crusher are such as to give a substantially straight-line grading as shown on Fig. 3, then these curves and the figures derived from them may be used as given in this article. But if actual tests show curved line grading, then the operator must make tests of the product obtained with different crusher settings and derive his own percentages following the method herein presented.

Necessary Calculations

Now come the calculations which are simple but a trifle tedious. When once made for any plant, they need not be repeated except that there be changes in the sizes of screens, or of the grading of the materials shipped. In Table 2, I will show the calculations for the coarsest crusher product of 80% passing 2½ in., and also for the grading of a finer setting; namely, 80% passing 1 in., in Table 3.

Refer again to Fig. 3, and it will be seen that the percentages of the different "true" sizes are shown on the coarsest curve. These become Column 1 in Tables 2 and 3. Obviously these must total 100%. According to the grading specification of any material, it has so much "true" size and so much of smaller sizes in it. Pennsylvania No. 4 (line A) is then calculated. In Table 1 it is seen that No. 4 has 50% passing 2½ in. so that the 50% retained constitutes the true size. There is 5% passing 1½ in., leaving 45% between 2½ in. and 1½ in. The increment of

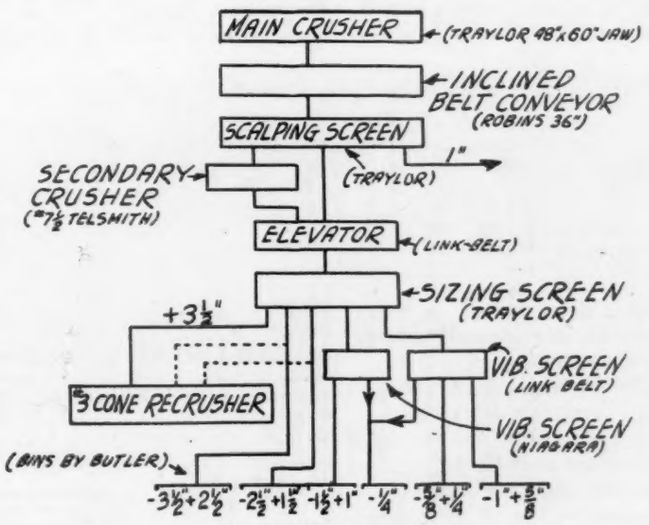


Fig. 1—Flow sheet of crushed stone plant of Warner Co., Cedar Hollow, Penn.

TABLE I—PERCENT PASSING ROUND HOLES

	3½-in.	2½-in.	1½-in.	1-in.	⅝-in.	⅜-in.	¼-in.
Fine screenings (not a P.S.H.D. size)	...	...	...	...	...	100	95
No. 1B P.S.H.D*	...	...	...	...	100	...	15
No. 1C P.S.H.D	...	...	...	100	70	...	5
No. 2B P.S.H.D	...	...	100	60	25	...	...
No. 3 P.S.H.D	...	100	50	30	10	...	...
No. 4 P.S.H.D	100	50	5	...	...	...	...

*Average gradings which will satisfactorily meet Pennsylvania State Highway Department specifications. These gradings are used for the calculation of the percentages of the different sizes produced.

smaller sizes is in terms of the quantity of true size, and it clarifies the calculation to show this in fractions. Therefore, in line A, showing Pennsylvania No. 4, the calculation is as follows:

Column 1 shows the true percentage from the grading curve.

Column 2 is the deduction from true size represented by tramp undersize in the larger products. In this case, 2% tailings is assumed. In the lower lines, this item becomes more precise.

Column 3 is the net amount of true size (Col. 1 — Col. 2).

Column 4 is the ratio of next lower size that is 45/50ths of the true size.

Column 5 = Col. 3 × Col. 4 and constitutes the increment of this smaller size.

Column 6 is the ratio of the next smaller size contained, that is 5/50 of the true size.

Column 7 = Col. 3 × Col. 6.

Line B shows the same calculation for Pennsylvania No. 3. Since the preceding size of No. 4 contained 16 parts of this true size, as shown by Col. 5, this amount must now be deducted in Col. 2, leaving a net amount of 32 — 16 = 16 in Col. 3.

In the average grading of No. 3 from Table 1 we have in the same way proportional parts of different sizes as follows:

50/50ths, true size
20/50ths, of —1½ + 1
20/50ths, of —1 + ⅝
10/50ths, of — ⅝ + ¼

and these calculations are carried out in Columns 6 to 11, inc.

The next smaller size, Pennsylvania No. 2B, Line C, has 16 parts of true size, which has been reduced by two parts in No. 4 and 7 parts in No. 3, or a total of 9 parts, leaving net only 7 parts of this true size. It has 40 parts of plus 1 in. and contains the next smaller materials in the respective ratios of 40/40ths and 20/40ths.

In the same way, Pennsylvania 1C (100% through 1 in.) contains only 30% plus ⅝ in. so the ratios of smaller sizes become 65/30ths and 5/30ths respectively. Pennsylvania 1B likewise contains 15/85ths of minus ¼ in.

Note: For those making these calculations for their own products, a simple check of

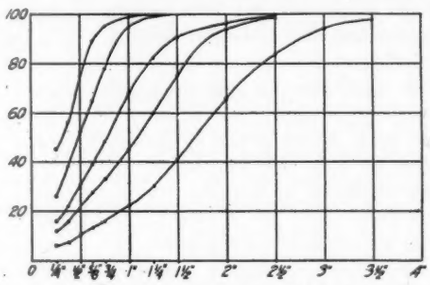


Fig. 2—Crushed stone gradings for various settings of cone crusher

the figures is that the sum of the numerators in these ratio fractions plus the denominator, always equals 100.

Column 14 is the total obtained by taking the sum of the odd-numbered Cols. 3, 5, 7, etc. If the work is correctly done, this Col. 14 always totals 100%. Col. 15 is a corrected column, in this case, omitting the 2% oversize and giving 2% to Line D, Pennsylvania 1C, which had figured out at zero, since there is always sure to be some percentage of any size.

Table 3 shows the same calculation for the curve of 80% passing 1 in. Here we have the phenomenón that the larger sizes of Pennsylvania No. 3, Nos. 2B and 1C should contain more of the 1B than actually exists, that is the sum of the figures in Col. 11 as originally calculated, is greater than the amount in Line E, Col. 2. Therefore, these figures are arbitrarily reduced and the corrected figures are used to supply the total in Col. 14. This means that the larger materials are somewhat deficient in their finer gradings, and where this exists to a pronounced degree, the figure is indicated by an asterisk (*).

Conversely, whenever there is a high percentage of any one size, the probabilities are that the limits of practical screening efficiency will cause an undue preponderance of that size to appear as tramp undersize in the next larger product. When the general plant is running steadily, the usual layout provides that the re-crushed product is re-circulated and screened with fresh primary product, so that these special conditions tend to be dissipated in the general operation. On the other hand, the error will become more pronounced if the re-crusher is set close, larger sizes being re-crushed and the circulated load thereby becomes large as compared with the primary load.

Similar calculations must be made for each of the curves on Fig. 3, and total percentages obtained in Col. 14 or Col. 15 if corrected. The results are now tabulated in Table 4. These results are shown graphically on Fig. 4.

Study of Graphs

A study of the graphs in Fig. 4 shows what are apparently some serious paradoxes. I was rather astonished myself at the great height and narrowness of the peaks of these curves. It has been generally felt that these curves should be well rounded so that great precision of crusher adjustment was not necessary to secure a maximum per cent of a desired product. The No. 3 cone crusher, upon which these tests were made, has 24 steps in its adjustment per complete revolution of the bowl. The pitch of the thread is 2 in. Thus each adjusting point means a vertical movement of the bowl of only 1/12 in. On the bowl of our crusher, we have numbered these points, No. 1 being the closest setting and No. 17 the widest. These settings are shown on Fig. 4. This scale of adjustments shows the marked effect of small steps

TABLE II—PROPORTIONS OF PENNSYLVANIA STATE HIGHWAY DEPARTMENT SIZES MADE WHEN RE-CRUSHER IS SET TO PASS 80% THROUGH A 2½-IN. SCREEN.

	P.S.H.D. No.	Size Pass.	True 1	Percent Ded. 2	Net 3	Ratio 4	Inc. 5	−2½ + 1½ R 6	−2½ + 1½ I 7	−1½ + 1 R 8	−1½ + 1 I 9	−1 + ⅝ R 10	−1 + ⅝ I 11	−⅝ + ¼ R 12	−⅝ + ¼ I 13	−¼ Total 14	Corrected 15
	Oversize	.....	..	..	2	....	....	....	...	....	....	....	....	....	....	2	..
A	No. 4	3½-in.	20	2	18	45/50	16	5/50	2	....	....	....	....	....	....	36	36
B	No. 3	2½-in.	32	16	16	....	....	20/50	7	20/50	6	10/50	3	....	....	32	32
C	No. 2B	1½-in.	16	9	7	....	....	....	...	40/40	6	20/40	4	....	....	17	17
D	No. 1C	1-in.	12	12	...	....	....	....	...	....	....	65/30	....	5/30	....	..	2
E	No. 1B	⅝-in.	12	7	5	....	....	....	...	....	....	....	....	15/85	1	6	6
F	Screenings	¼-in.	8	1	7	....	....	....	...	....	....	....	....	....	....	7	7
			100	...	...	....	....	....	...	....	....	....	....	....	....	100	100

TABLE III—80% PASSING 1-IN.

A	No. 4	.....	..	..	...	....	....	....	...	....	....	....	....	....	....	..	..
B	No. 3	2½-in.	3	..	3	....	....	20/50	2	20/50	1	10/50	1/9	....	....	6	6
C	No. 2B	1½-in.	17	2	15	....	....	....	...	40/40	15	20/40	7/5	....	....	35*	35*
D	No. 1C	1-in.	30	16	14	....	....	....	...	....	....	65/30	30/25	5/30	2	41*	39*
E	No. 1B	⅝-in.	30	30	...	....	....	....	...	....	....	....	....	....	....	..	2
F	Screenings	¼-in.	20	2	18	....	....	....	...	....	....	....	....	....	....	18	18
			100	...	...	....	....	....	...	....	....	....	....	....	....	100	100

In Table 3, Column 11, there is a deficiency of the product — ⅝ + ¼ to fill the gradings of the larger sizes. The number above the slant is what should be and the number below is an arbitrary reduction.

in the lower range. The range of greatest opening is also quite sensitive in its effect on the large sizes. There seems to be less sensitiveness in the intermediate range.

The seemingly erratic production of No. 1B is easily explained. When No. 1C reaches its high maximum, it carries much 1B with it, reducing the "free" or surplus 1B to a minimum. For a somewhat coarser setting, the proportion of 1C goes to a minimum so that the 1B reappears as a free size.

Now we will discuss the practical use of these curves. When they are once prepared, they are good so long as there is no physical change in the plant as to screen sizes, etc., or no change in the grading of the sizes shipped. The curves should be drawn on tracing cloth, in enlarged form, say 20 in. by 30 in., and prints made using a paper that prints white. A print should be mounted on a board at a point convenient to the plant, probably in the screen testing room.

Simple instructions will enable the foreman or crusher man to adjust his re-crusher to give optimum results. The steps are set down, with an illustration of the steps shown on Fig. 4.

(1) Test the product of the re-crusher. Use the standard screens which you use in your ordinary practice, say 2½ in., 2 in., 1½ in., 1¼ in., 1 in., ¾ in., ⅝ in. and ½ in. Begin with the largest screen. As soon as you have worked down to a screen that shows less than 80% passing, you may cease further testing. Let us assume that this re-crushed product showed 72% passing a 1-in. screen. (See Fig. 4.)

(2) Draw a line from the zero point through this 72%—1-in. point and project this line until it intersects the 80% line. As a matter of convenience, a nail can be driven in the zero point and a light strong cord attached to it. This cord can then be used as the straight edge.

(3) From the intersection with the 80% line, a vertical line will intersect the various curves indicating the respective percentages produced. In this particular illustration, these percentages will be:

	%
Screenings	16
Pennsylvania 1B	6
1C	22
2B	44
3	12
4	0
	100

Mechanics of Adjustment

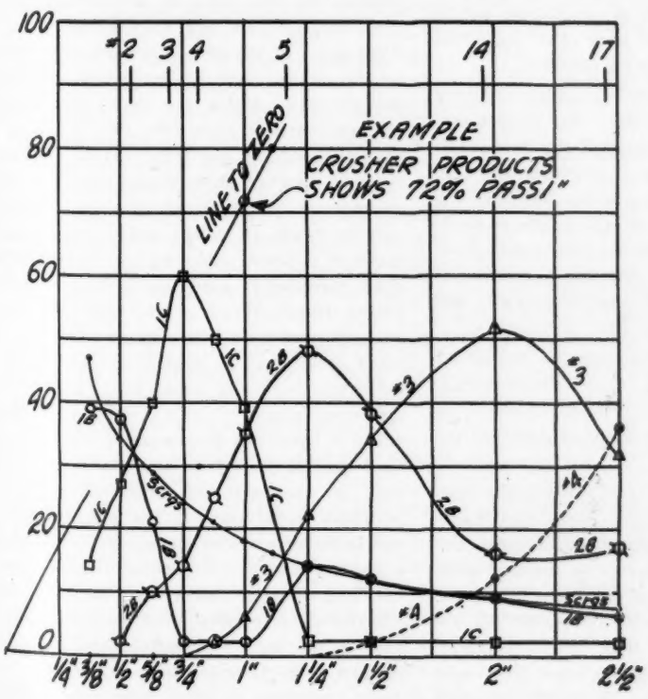
It is seen that this method is independent of the wear on the crusher liners. However, some system of marking the crusher adjustments is desirable. The cone crusher lends itself particularly well to a system of marking since the entire outer casting is revolved in making the adjustments. These points may be marked for future reference. For example, the operator will find that point No. 5 gave him 72% passing 1 in. As the crusher parts wear, a later test might show only 66% passing 1 in., so that it would be necessary to give the crusher a closer setting, say to point No. 4, to get the same crushing result that was previously obtained at No. 5. Accumulated records of date, adjustment point and the per cent passing some standard screen (within the range of 60% to 80% passing) will give the necessary data and experience to enable the operator to adjust his re-crusher with great precision.

Gyratory crushers are usually adjusted by the suspending nut at the top, and the operator must devise some method of marking this, so that he can readily set the crusher to any desired point to give known results. The disc crusher and certain others are not readily adjustable. They are simply taken up from time to time when their product becomes too large, causing too great a circulating load. But even with these crushers, the method herein presented may be used as a precise indicator as to when it is time to take up. A wedge gauge should be provided. This is inserted between the discs at point of minimum opening to determine accurately the amount of the opening. This should be done both before and after taking up the crusher, together with tests of the product before and after. In this way, data will be accumulated which will enable the operator to give definite instructions on how much the crusher should be taken up to give predicted results with some accuracy.

To facilitate these precision adjustments, crusher manufacturers should furnish their machines with adjustment markers. This will not only enable the operator to adjust with great precision but will also give data on rate of wear and the approach of the time when it will be necessary to replace the wearing parts.

TABLE IV—PRODUCTION PERCENTAGES OF VARIOUS PENNSYLVANIA STATE HIGHWAY DEPARTMENT SIZES WHEN RE-CRUSHER IS SET SO THAT 80% OF ITS PRODUCT PASSES THE SCREEN GIVEN IN COLUMN AT LEFT.

80% Passes Screen	No. 4	No. 3	No. 2B	No. 1C	No. 1B	Scrgs.
2½-in.	36	37	17	2	6	7
2-in.	12	52	16	2	9	9
1½-in.	2	34	38	2	12	12
1¼-in.	..	22	48	2	14	14
1-in.	..	6	35	39	2	18
⅞-in.	(Interpolated)	2	25	50	2	21
¾-in.	..	..	14	60	2	24
⅝-in.	..	..	10	40	21	29
½-in.	..	..	2	27	37	34
⅜-in.	..	..	..	14	39	47



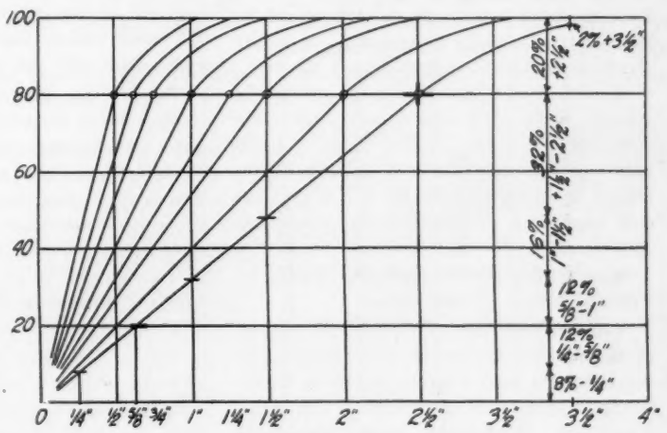


Fig. 3 (Above)—Grading curves conventionalized to straight lines to 80% passing various test screens. Fig. 4 (Left)—Relation of recrusher settings to 80% of stock passing various screens

Price Control and the N. R. A.*

By George P. Ellis, C. P. A.,
Wolf and Company

NO thornier problem has arisen in the administration of N.R.A. than that of price control. The matter was crucial from the very beginning; on every side business men were asking: Is it possible to raise costs in advance of compensatory price increases? What is legitimate profit, or has profit no place in the new plan? And to these questions the administration has kept silent, beyond urging that if prices must be raised to meet the re-employment costs, that they be raised rather less than the added cost, especially if a considerable sales volume might be expected to flow from the increased employment while holding down prices.

So fundamental is the price question that it can no longer be ignored. Some administration policy will have to be formulated definitely in the next few months.

Administration Attitude

In general, the Administration attitude toward manufacturing price control must be sought in the law and the background of congressional discussion, in Federal Trade Commission precedent, and in the permanent codes so far approved for industry. No very deep study is required to see that price control is implicit in the law. In the first place, it was contemplated by the framers of the statute, and the Borah Amendment, which would have specifically prohibited price-fixing, was voted down. As a result, price-fixing is not forbidden in the law, *provided* it does not lead to "monopolies or monopolistic practices." Whether or not price-fixing is possible without a "monopolistic tendency" can only be determined by the courts. Our only precedent is the rather startling decision in Appalachian Coals, Inc., v. United States last March, in which the United States Supreme Court under the leadership of Chief Justice Hughes (with only one dissent) upheld a joint exclusive selling agency organized by 137 bituminous coal producers. Production and marketing conditions in the coal industry warrant a form of organization which can hardly be followed safely in other fields.

In the second place, a considerable degree of latitude was allowed in the provision that the President must approve any code before it can supplant the limitations of the Anti-Trust law. Withdrawal of the President's approval at any time makes the industry immediately subject to the anti-trust laws, with the former penalties for price-fixing in restraint of trade.

Third, the codes established under the law are aimed at elimination of unfair competition, the grossest form of which is price-cutting. The abolition of price-cutting necessarily entails a degree of price control. All codes provide for outlawing "sales below cost of production or replacement."

Fourth, licensed price-fixing is permitted under the Agricultural Adjustment Act, and to the extent that such price-fixing applies to the food industries, price-fixing is a competitive factor in a major industrial group that will necessarily affect other industry. For example, the fluid milk industry has been licensed under as rigid price control as a public utility. It may even be defined presently as a genuine public utility. The California peach canning industry has obtained approval of a code which not only attempts to fix equal compensation to growers, whether their crop be canned or left to spoil, but sets minimum and maximum prices for the canned products, within which range the canner may publish his individual price.

Similar maxima and minima are contemplated in the evaporated milk code. Doubtless, any industry which can claim relationship to food-processing will seek price-fixing permission. So far, however, price-fixing has been approved only where cut-throat conditions were met, or where production acreage could not be reduced without capital loss.

Real Test

The real test is coming in the manufacturing industries which can claim no freedom of action under the Agricultural Act. Our only guide here is the development in codes already approved. Omitting the natural resource industries in which price control is essential to regulation of production and to aid conservation, what have other industrial codes done with the price question?

The first one, the textile code, says nothing explicit about price-fixing. But it does provide for "recommendations" by a Central Control Committee "as to methods and conditions of trading, the naming and reporting of prices which may be appropriate to avoid discrimination, to promote the stabilization of the industry, to prevent and eliminate unfair and destructive competitive prices and practices."

This is wide-open authority to do almost anything desired in the way of price-making. The Government hand is in the addition of three non-voting government members to the Control Committee.

The iron and steel code provides for open price quotation on basing points plus transportation costs and uniform additional elements. The prices may not be changed without 10 days' notice, and selling below the quoted prices is subject to a penalty of $10 per ton, payable to the "code" treasurer. The price provisions of the steel code went through without change. With the minimum of fuss, the steel industry got what it wanted.

Another code, that of the corset and brassiere industry, provides for uniform price quotation, without specifying the quality to be offered therefor. Competition in quality is substituted for competition in prices.

The electrical manufacturing industry code provides that no manufacturer shall sell below his own cost except when forced to meet competition. Printed price lists are filed with the Control Committee and must be observed. Changes cannot be effective without 10 days' notice, unless with special permission of the Committee. The actual wording of the code is as follows:

"No employer shall sell or exchange any product of his manufacture at a price or upon such terms or conditions that will result in the customer paying for the goods received less than the cost to the seller, determined in accordance with the uniform and standard method of costing hereinabove prescribed (except dropped lines, seconds, or inventories) . . . provided further that selling below cost in order to meet existing competition on products of equivalent design, character, quality or specifications shall not be deemed a violation of this Article if provision therefor is made in supplemental codes for any branch or subdivision of the industry, which may be hereafter prepared and duly approved by the Administrator.

"If the supervisory agency determines that in any branch or subdivision of the electrical manufacturing industry it has been the generally recognized practice to sell a specified product on the basis of printed net price lists, or price lists with discount sheets, and fixed terms of payment which are distributed to the trade, each manufacturer of such product shall within ten days after notice of such determination file with the supervisory agency a net price list or a price list and discount sheet as the case may be, individually prepared by him showing his current prices, or prices and discounts, and terms of payment, and the supervisory agency shall immediately send copies thereof to all known manufacturers of such specified product. Revised price lists with or without discount sheets may be filed from time to time thereafter with the supervisory agency by any manufacturer of such product, to become effective upon the date specified therein, but such revised price lists and discount sheets shall be filed with the supervisory agency ten days in advance of the effective date, unless the supervisory agency shall authorize a shorter period. Copies of revised price lists and discount sheets, with notice of the effective date specified, shall be immediately sent to all known manufacturers of such product, who thereupon may file, if they so desire, revisions of their price lists and/or

*Reprinted from the September issue of the *Illinois Journal of Commerce.*

discount sheets, which shall become effective upon the date when the revised price list or discount sheet first filed shall go into effect.

"If the supervisory agency shall determine that in any branch or subdivision of the electrical manufacturing industry not now selling its product on the basis of price lists with or without discount sheets with fixed terms of payment the distribution or marketing conditions in said branch or subdivision are similar to or the same as the distribution or marketing conditions in a branch or subdivision where the use of price lists with or without discount sheets is well recognized, and that a system of selling on net price lists or price lists and discount sheets should be put into effect in such branch or subdivision, each manufacturer of the product or products of such branch or subdivision shall within twenty days after notice of such determination file with the supervisory agency net price lists or price lists and discount sheets as the supervisory agency may direct containing fixed terms of payment showing his prices and discounts and terms of payment, and such price lists and/or discount sheets and terms of payment may be revised in the manner hereinabove provided.

"No employer shall sell directly or indirectly by any means whatsoever any product of the industry covered by the provisions of this Article at a price lower or at discounts greater or on more favorable terms of payment than those provided in his current net price lists or price lists and discount sheets."

Actual Facts

The boiled down essence of this "open price association" is this:

The manufacturer is governed by the price he has filed with the Control Committee. This price must be a conservative one based upon his own cost of production, because if wrong it cannot be quickly changed. But the manufacturer may sell below his own cost to meet competition. The competitive lower price is also on file. The net result is that the lowest competitive price (based upon the manufacturer's own cost of production) which is on file with the Control Committee is the minimum price for that product in the market. This is price-fixing by another name but price-fixing just the same.

There is also in this the inference at least that code prohibitions against selling below cost may be modified as administration shows up weaknesses in the present code law.

From the foregoing it is possible to deduce certain principles:

(1) Open price associations such as Federal Trade Commission approved in the past, are encouraged under N.I.R.A. in so far as they cover past transactions. The steel "open price association" was the product of Federal trade regulation in other years and was shorn of controversial aspects long before submission to N.I.R.A.

(2) Selling below cost is condemned in all codes, but there is no announced governmental formula for cost.

For example, there has been no definition of cost; no statement of whether cost shall be the actual cost of each unit, or whether some average ideal cost shall be allowed. For the natural resource industries, average cost was approved; for the more complicated manufacturing industries no decision has yet been made. There has been no pronouncement of how to write down excess plant capacity in determining cost.

Perhaps the best statement available to date is the "cost" section of a code, recently revised in a preliminary hearing in Washington. The industry has had no recognized cost system, nor a standard accounting procedure.

"No member of this industry shall sell or offer for sale units at a price less than their 'reasonable cost of production and distribution.' The National Code Committee shall, subject to the approval of the Administration, set up as soon as practicable a standard method of cost accounting for the industry. Said Committee shall, subject to the approval of the Administration, define 'reasonable cost of production and distribution' for the purposes of this code and determine upon a basis to be uniform among the members of this industry the *character* of the items to be included within such 'reasonable cost of production and distribution.'"

(3) Limitation of production as provided in those codes where machine hours are limited (Textile Code), or where installation of new equipment, replacements or modernization are controlled, operates to stabilize prices.

Plant expansion in order to obtain greater volume at lower unit cost is temporarily at least out of the picture, but in the long run high cost production will inevitably be eliminated.

(4) Limitation of profits (under the new tax schedules) is a definite price control factor.

(5) With the new emphasis upon costs if an industry is to survive, cost accounting is fundamental, standard cost accounting systems for whole industries are approved, but so far uniform overhead percentages have not been accepted.

(6) Uniform price quotation which does not specify the quality offered at the price was not objectionable in at least one of the codes.

(7) Resale Price Maintenance has not so far been approved; quite possibly it will be rejected.

(8) The broad "open price association" of the Electrical Manufacturing Industry affords no precedent for wholesalers and retailers.

(9) Prohibition of all forms of price-cutting such as "loss leader rebates, secret discounts," puts the emphasis now upon quality and service, rather than volume at any cost.

Price Fixing in Codes Is Taboo

THE Consumers Advisory Board of the National Recovery Administration, at a meeting September 8, adopted as a policy opposition to general price fixing provisions, direct or indirect, in all codes, with the exception of a limited number of "natural resource" industries where cut-throat competition has led to public disaster.

In cases where price fixing is permitted for a trade or an industry generally, the Board, as an outline of policy to guide the efforts of its special representatives in the framing of the N.R.A. codes, urged that definite public responsibility for the reasonableness of the prices set be fixed upon the Code Authority, with provision for review of prices set by the N.R.A. Administrator.

Where codes bar selling below cost, the Board recommended that its special representatives endeavor to secure provisions to permit the public to be enlightened on what the cost in question is. Otherwise, the Board held, a provision against selling below cost becomes a one-sided proposition, with the consuming public on the outside.

In addition to making many technical recommendations to its representatives for handling code problems, the Board undertook to draw up a comprehensive plan for checking the reasonableness of price increases under the codes. The question of upholding standards of quality, which also are a determining factor in price setting, was held to be a major concern of the Board.

Sand-Lime Brick Production and Shipments in August

THE FOLLOWING DATA are compiled from reports received direct from producers of sand-lime brick located in various parts of the United States and Canada. The accompanying statistics may be regarded as representative of the industry.

Fifteen sand-lime brick plants reported for the month of August, this number being four more than the number reporting for the month of July, statistics for which were published August 25:

Average Prices for August

Shipping point	Plant price	De-livered
Madison, Wis.	$11.50	$13.50
Pontiac, Mich.	....	11.50
Dayton, Ohio	9.00	10.50
Flint, Mich.	11.50	13.00
Saginaw, Mich.	9.50	....
Syracuse, N. Y.	18.00	20.00
Grand Rapids, Mich.	....	12.00
Mishawaka, Ind.	8.50	....
Medfield, Mass.	8–9.00	9–10.00
Toronto, Ont., Can.	12.00	13.50

Statistics for July and August

	†July	*August
Production	1,147,562	2,083,900
Shipments (rail)	14,500	58,000
Shipments (truck)	946,655	1,418,755
Stocks on hand	2,041,947	3,130,066
Unfilled orders	3,955,000	865,000

†Eleven plants reporting; incomplete, four not reporting unfilled orders.

*Fifteen plants reporting; incomplete, five not reporting unfilled orders.

Rock Products News Briefs

National Association of Portable Sand, Gravel and Stone Producers Organized

OUT of a protest meeting of a group of operators of portable sand, gravel and crushed stone plants, in connection with the hearing on the proposed code of the mineral aggregate industries at Washington, August 28, the National Association of Portable Sand, Gravel and Stone Producers has been organized with headquarters in Washington, D. C. A permanent organization was effected at a meeting held behind closed doors in Chicago, September 25, at which about 50 representatives of portable plant operations, state, county and contractor, and of machinery concerns making portable plant equipment, were in attendance.

The purpose of the group, it seems, is merely organization to assure protection of their interests, under a common code of the industry, not divorce from the rest of the mineral aggregate industry. The principal changes in the code of the mineral aggregate industries which the portable plant group seeks to have made are those on organization and administration, and in the much debated article V on control of production. The portable plant operators would strike out entirely all attempt to control production on the basis that the elimination of unfair practices in the industry will automatically eliminate any overproduction.

The changes suggested in organization would make the National Control Committee or the Code Enforcement Committee consist of representatives by states instead of the 16 regions, and give portable plant operators equal representation with operators of stationary plants.

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Gypsum

United States Gypsum Co., Chicago, Ill., has been sued by several of its ex-employes at Oakfield, N. Y., for alleged injury to health from breathing gypsum dust. According to the *Batavia* (N. Y.) *News* 12 suits have been started for $100,000 each. The newspaper states: "The cases are an outgrowth of a new branch of litigation throughout western New York in which workmen are making claim for health injuries alleged to be due to occupational disease. William L. Clay, Rochester attorney, who represents all of the 12 plaintiffs in the U. S. Gypsum Co. cases, is attorney in several groups of similar cases brought against industrial plants of Buffalo, Rochester, Niagara Falls, Perry and other western New York communities. Complaints in all 12 cases are the same except for such details as average earnings and the period of time the men were employed in the plant. A sample complaint alleges that a plaintiff worked 17 years in the U. S. Gypsum Co.'s mill No. 1 and that his average earnings were $35 a week. It is alleged that the company failed to comply with labor and health law requirements for ventilating equipment and safety devices and that as a result all of the men are now suffering from pneumoconiosis and pulmonary fibrosis, impairing their health to such extent that each of them asks $100,000 compensation."

There is a considerable literature on the subject of the effects of gypsum and limestone dusts on health, all of it of a general tenor that these particular mineral dusts are healthful rather than harmful. Rock Products has published numerous articles to that effect. The suits described are evidently partly results of the depression and unemployment and the work of unscrupulous lawyers.

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Cement

Universal-Atlas Cement Co., which planned to make bulk shipments of cement from its Hannibal, Mo., mill by barge on the Mississippi and Ohio rivers to the United States Government project on the Green River, has been compelled to ship by rail because of low water in the river.

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German and Belgian cement shipments to Portland, Ore., from January to August, inclusive, amounted to 6,150 bbl. This was sold to individual contractors and small dealers, invariably at prices below those of the domestic producers. It is believed no such sales were made for use in public works. These regular importations, while not heavy, are of sufficient importance to disturb market stability, while domestic plants are operating at about one-third capacity.

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Good Iowa logic is found in this editorial from the *Shenandoah Sentinel* under the caption "NRA Works Both Ways":

Announcement appeared in the *Des Moines Register* Friday that the Dixie Cement works near that city had just closed down and laid off 100 men, shutting the doors at noon. Reason given was that their warehouses are full of cement and the public works projects are so slow in developing that they can not sell their product and they have no facilities for storing up more product that they can not sell.

Announcement was given that the Hawkeye mills at the same city would close in a few days, laying off 350 men.

It sounds all right to say to a manufacturer "Cut down the hours of your employes, pay more wages and hire more men." But suppose you can not sell the product then what?

Months ago the promise was given to start vast projects immediately to employ millions of men, but the red tape has held back the projects and winter is nearly here and the men mostly still idle.

NRA is fine but there are two sides to the story. If you put many men to work manufacturing goods you must provide buyers for the projects, and to provide buyers you must provide them with money—so it all reverts to the claim the *Sentinel* has been making for years—Inflation. Some way must be provided to give people money to buy the things they need or want. More money and cheaper money would enable people to pay debts and taxes and interest and have some money left to buy things, and you are not going to end this depression in any other way.

Making business men and factories employ more labor at higher wages to make more than they can sell will not work any better than it does on the farm.

Farmers are asked to raise less, and just the same argument will apply to the factory —make less—employ less labor. It is just as foolish to fill the mill with what you can't sell as to fill the granaries with corn or wheat you can't sell.

Who can blame the cement mills for shutting down. To order them to keep on producing a surplus is just like ordering the farmer to raise more than he can sell on the market.

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Pennsylvania-Dixie Cement Corp., New York City, announces the appointment of W. H. Klein as general operating manager of all the corporation's plants, with headquarters at Nazareth, Penn. Mr. Klein, a graduate of Michigan University, has long been identified with the cement industry and is well known through his activities in connection with technical research and development. He is a member of Committee C-1 of the American Society for Testing Materials, and for a number of years has been chairman of the technical problems committee of the Portland Cement Association, and is also a member of the American Concrete Institute. Entering the industry in 1906 as chemist for the Kansas Portland Cement Co., Mr. Klein soon occupied the position of general superintendent and a few years later joined with the Dixie Portland Cement Co. at Richard City, Tenn., in the same capacity; he remained with that company until its acquisition by the Pennsylvania-Dixie Cement Corp., and has since been serving as general manager of the Southern division for the latter organization, with headquarters at Chattanooga, Tenn. In addition to his activities in the cement industry, Mr. Klein is also vice-president of the Dixie Sand & Gravel Corp. and a director and member of the executive committee of the National Sand and Gravel Association.

Editorial Comments

Altruism, Idealism and Business

The real problem facing every business man in industry today, whether he recognizes it or not, is how far he can practice altruism and idealism and retain his own conception of an efficient and successful business man. If you don't believe that, read the following quotation from an address by the man who, more than any other, is reputed to be the author of the National Industrial Recovery Act—Donald R. Richberg, general counsel of the National Recovery Administration: "For many decades we have been developing an unfortunate habit of thought whereby we test the success of a business enterprise by the profits it produces for its owners. This is simply looking at industry upside down; and we can reasonably assume that before many more years many of our economists, politicians, labor leaders and even business men will cease standing on their heads and begin to see the facts of industrial operations right side up."

If his is to be the accepted policy of business men, it is obvious that business men of this generation will need a large amount of orientation to be headed in the right direction for success under the New Deal. According to Mr. Richberg, all business will become a public service, and capital will become just a tool for the use of which only a modest return can be expected. Managers of business—the brains of industry—will have to be satisfied with much less, and labor will get a much larger return than heretofore.

Business men of many generations of business men behind them will have to change their theory that to be successful in business one has to be a good trader. For, according to Mr. Richberg, it is most unethical to get more in a trade than you give; all exchanges of goods and services must be such that neither buyer nor seller is the gainer—in other words, profit as we know it will be taboo.

It is hardly to be expected that Mr. Richberg, or any other man who, like him, has proved himself capable of earning $50,000 a year or more, thinks that he can so completely change the course of human thought and experience by means of the NIRA, or any other device, within the lifetime of this present generation of business men; so we assume that he has merely established a high goal to shoot at; and, as experience at Washington every day proves, he is prepared *to trade* on that basis for the best deal, or the nearest approach to the New Deal, he can induce business men to make.

Most, if not all, good business executives, being good traders, sense this situation, and instead of going to Washington bowing acquiescence to all demands of such reputed idealists as Mr. Richberg, go prepared with demands, or trading propositions, of considerably more than they hope or expect to achieve, knowing that compromises must and will be made, somewhere between the extremes of pure idealism and altruism on the one hand, and a continuance of "rugged individualism" on the other. We suspect that Mr. Richberg and his associates would be the most surprised of any one, should their offering be accepted unequivocally by practical business men.

A case in point is the present problem of the mineral aggregate industries. Their code was so drawn (and it obviously should have been) as to lay particular emphasis on two kinds of competition that have done much to demoralize the industry—the competition of municipal, county and state operations, which pay no taxes, keep no costs, observe no business rules or standards, and the competition of operators of portable plants. The commercial producers' position was stated so strongly, or eloquently, that it has driven the portable plant competitors into a separate organization to fight, as they believe, for existence.

Some short-sighted critics of the operators of established plants, including our esteemed contemporary, go so far as to belabor these business men of the mineral aggregate industries with harpings on their selfishness and their alleged attempt to legislate out of existence what these uninformed critics say is the new and progressive way of producing aggregates. We can't see it that way; we still have faith in the business capacity of the men of this industry. They are and should be good traders; because the industry which has no good traders would be lost in the present shuffle for the New Deal.

We are sure the business men of the mineral aggregates industries recognize, as Rock Products, their spokesman has always recognized, that there are three definite and specific kinds of operations in this field, as we have reiterated many times: (1) the fixed plant, (2) the temporary or movable plant, (3) the portable plant. Each has a definite and specific sphere in the economics of the industry. Because peculiar and perhaps only temporary conditions have disturbed the natural economic balance between the spheres of operation of these three kinds of plants, a lot of misunderstanding and acrimony has arisen.

The chief, if not only reason commercial producers have not expanded their own operations to include portable plants is because the operation of portable plants has been such a cut-throat proposition that it offered no opportunity for anyone in it. If the code of the industry is going to make it possible for portable plant producers to operate at a fair profit, it is a pretty safe predicition that commercial, or fixed plant, operators will go into the portable plant business where and when it is the economic thing to do.

Therefore, we believe the organization of portable plant operators and their fight "for a place in the sun" will prove a healthful thing for the industry. By an able presentation of their case, a definite, all-around understanding of their place in the economics of the industry, and their universal acceptance as a legitimate branch of the industry, the trading at Washington can not fail to result in a compromise that should do much to consolidate the whole industry on a wholesome basis; and perhaps eventually really lead to the elimination of that most hateful competitor of all legitimate producers, the publicly-owned plant.

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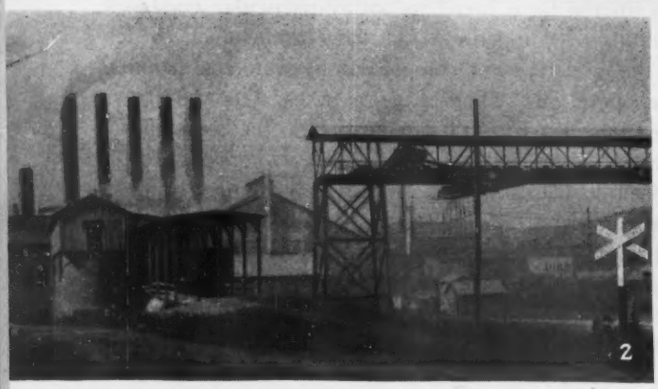

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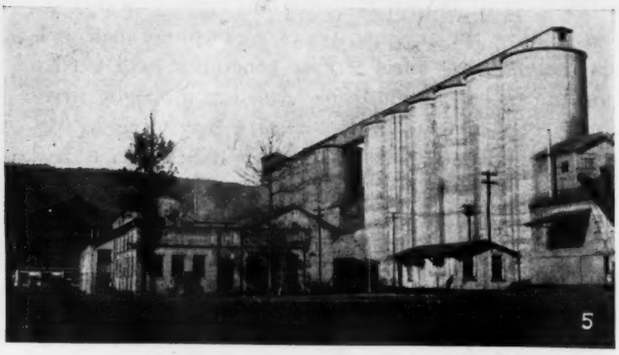

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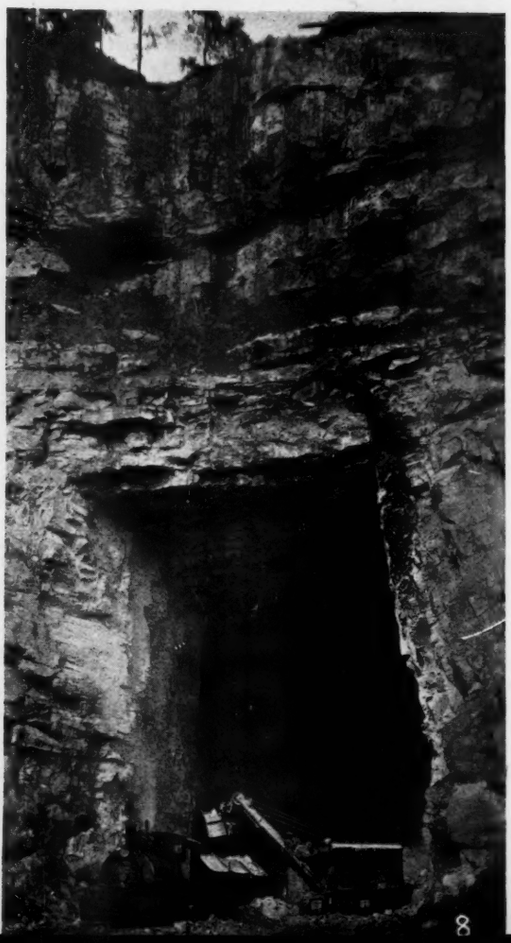

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Tennessee Cement Industry Sees Bright Future

Plans for Federal Development of Tennessee Valley Find Producers Ready to Meet All Demands[1]

By Geo. I. Whitlatch,

Assistant Geologist, Tennessee Division of Geology

THE CEMENT INDUSTRY of Tennessee is largely confined to the eastern part of the state. Five of the six plants are within the limits of Tennessee River Valley. Thus, with the unfolding of President Roosevelt's program, this industry will contribute its share to the development of that area. The picture presented here will permit just appreciation of the ability of this industry to meet any increased market demands which may be created either by Federal construction or private enterprise.

Reports from cement manufacturers in Tennessee are optimistic. Although, at the time of this writing, purchase policies of the Federal Government in regard to the construction of Cove Creek dam and other public works have not been announced, and no estimate can be made of the direct effect of the program upon the cement plants of the state, manufacturers reasonably assume that there will be an equitable distribution of trade to all plants sufficiently close to points of consumption. Such a plan would permit continuous operation of these plants for many months.

Aside from Federal construction which may directly affect their plants, various officials of Tennessee cement plants anticipate increased local demand for cement in the development of private enterprises which will follow the work now being undertaken by the Federal Government. Factory building, new homes, apartment houses, hotels, public buildings, sewerage systems, city streets, bridges and new roads all offer potential increased markets for cement.

In 1907 the first plant for making portland cement was established at Richard City by the Dixie Portland Cement Co. The initial annual production was 272,731 bbl., "valued at $295,913."[2] By 1911 the annual production had increased to 600,000 bbl. In the same year the second plant, at Kingsport, was built by the Clinchfield Portland Cement Co. Both have since been merged with plants in other states and are operated by the Pennsylvania-Dixie Cement Corp., whose main offices are in New York City.

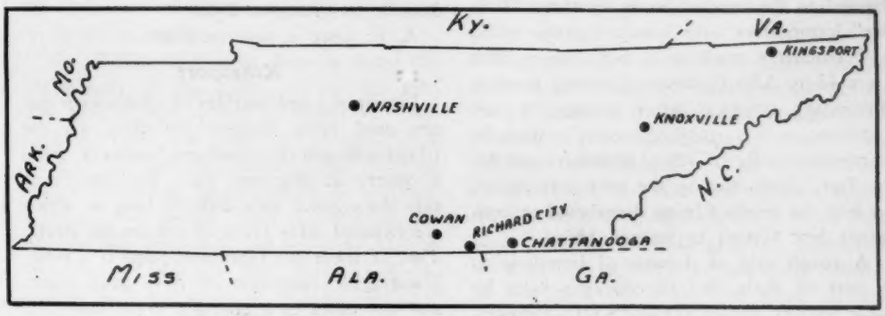
From 1911 to 1923 there was no further development in the industry in Tennessee, aside from gradual increase of production by the two mills then in operation. Each plant, in 1923, produced more than 1,000,000 bbl.[3] On October 12 of the same year the Signal Mountain Portland Cement Co. started production at the base of Signal Mountain, North Chattanooga. The initial daily capacity was 4000 bbl. A few months later, on March 21, 1924, production of cement was begun at Nashville by the Hermitage Portland Cement Co., in a mill of 2000 bbl. daily capacity. By 1926, these new additions to the Tennessee industry had increased the annual production to more than 5,000,000 bbl., which was approximately 2% of the national production for that year.

The Cumberland Portland Cement Co. opened a plant at Cowan on June 1, 1927. The daily output was initially rated at 2200 bbl. The sixth and most recently completed plant in the state is that of the Volunteer Portland Cement Co., Knoxville, which began operations on July 1, 1928. This plant was rated as having a daily capacity of 2200 bbl.

The largest production of the state in any one year was in 1926—5,221,814 bbl. In 1932 production had shrunk to 1,548,629 bbl.

With the exception of the Kingsport plant, all are using the wet process of manufacture. The total daily capacity of the industry is approximately 24,000 bbl. or about 8,000,000 bbl. annually.

[In the descriptions of the six operations, or plants, which follow, no attempt has been made to cover them comprehensively. Only a few features are mentioned which will serve to show their diversity. This diversity of practice is of interest in showing that there is plenty of opportunity for competition in costs of manufacture.—The Editor.]



Locations of portland cement plants in Tennessee

Richard City

Since 1907 this mill has been entirely rebuilt and at present is a modern wet-process mill.

Limestone and shale are secured from a single quarry at the base of a high ridge extending southeastwardly from the Cumberland plateau. The quarry, approximately 100 yd. north of the plant, has a face one-half mile long, roughly east-west along the base of the ridge. A depth of more than 100 ft. of limestone and shale is exposed in the face.

The shale, occurring in the basal part of the quarry, has its maximum exposed thickness of 20 ft. at the east end. The shale body is, however, lens-like in character and wedges out toward the west side. The average thickness is about 10 ft. The shale is dark gray, siliceous, and thinly laminated, yielding readily to light blasting and power shovel operations.

Above the shale is limestone, 90 to 125 ft. of which are being quarried at the present time. The limestones, bluish to dark gray in color, hard, and normally of coarsely crystalline character, are moderately thick-bedded and lie essentially horizontal. According to an unpublished report by E. R. Pohl, these limestones belong to the Glen Dean formation, Chester series, and are,

ILLUSTRATIONS

Cement plants of Tennessee shown on opposite page

1. ***Hermitage Portland Cement Co. plant, Nashville.***
2. ***Pennsylvania-Dixie Portland Cement Corp. plant No. 1, Kingsport.***
3. ***"Penn-Dixie" plant No. 3, Richard City.***
4. ***Aerial view of Volunteer Portland Cement Co. plant, Knoxville.***
5. ***Office and storage silos at Signal Mountain Portland Cement Co. plant, Chattanooga.***
6. ***Blasting marble and limestone at the Volunteer quarry, Knoxville.***
7. ***Cumberland Portland Cement Co. plant, Cowan, Tenn.***
8. ***Tunnel entry to limestone mine at plant of Signal Mountain Portland Cement Co., Chattanooga.***

[1]Published with the permission of W. F. Pond, State Geologist.

[2]Ashley, Geo. H., Outline introduction to the mineral resources of Tennessee: Tenn. Geol. Surv., Bull. 2A, p. 36 (1910).

[3]Statistical and historical data given in the remainder of the introductory part of this article have been obtained from the annual reports of the Tennessee Division of Mines and from the writer's field notes.

therefore, Upper Mississippian in age. The average chemical composition of both the shale and limestone is given in the accompanying table.

Quarry practice is to keep the limestone face considerably in advance of the shale face; the basal 3-ft. bed of limestone is left in place above the shale. The shale base thus formed furnishes an excellent floor for quarry operations contingent to the removal of the limestone.

Practically no overburden is encountered. Blast holes are well-drilled to an average depth of 90 ft. and are spaced 18 ft. apart and 30 ft. back from the quarry face. The usual charge in each hole is 60% dynamite on the bottom and 40% on the top.

Two "Marion" steam shovels, No. 125 caterpillar type and No. 60 rail type, load the rock into side-dump cars which are hauled to the crusher house by three "Porter" locomotives over standard-gauge track.

Preliminary crushing to 6-in. size is done by a 42-in. Allis-Chalmers gyratory crusher. Secondary crushing, after passage by belt conveyor over a scalping screen, is done by corrugated rolls of 72-in. diameter and 30-in. face. Reduction by the rolls is to 2½-in. or less, the product being distributed by conveyor belt system to storage bins.

A rough mix of 3 parts of limestone to 1 part of shale, fed to conveyor belts by table feeders, passes to two "SXT" Pennsylvania type hammer mills which reduce to ¾-in. or lesser sizes. The hammer mill product, with water, is gravity fed to two Smidth No. 106 "Kominuters." Closed-circuit, centrifugal screening returns all material over 3/32-in. to the "Kominuters."

All material of 3/32-in. and under is reduced in two tube mills to a fineness of 85-90% through 200-mesh. The finished slurry (35% moisture), after a thorough blending in a 1900-bbl. basin, is sent to eight 825-bbl. storage tanks. Samples of slurry for chemical control purposes are taken from the blending basin and the storage tanks.

Slurry, adjusted to proper chemical composition by drawing calculated portions from one or more storage tanks into a 6400-bbl. feed basin, is charged by pump and automatic feeder into two 11-ft. 3-in. by 343-ft. 9-in. "Unax" kilns fired with pulverized coal. Coolers are attached to the end of the kilns. Temperature is controlled by Leeds-Northrup electrical recording pyrometers. Drag chain conveyors remove the clinker to storage.

Clinker and gypsum are fed to a battery of eighteen 30-in. Griffin mills. These mills produce a primary fineness of 80% through 200-mesh. Final grinding to a fineness of 90% through 200-mesh is by the use of three 6½-ft. by 18-ft. tube mills.

The daily capacity is 6500 bbl. All equipment is operated by electric power. Coal is secured from local mines near Sequatchie Valley. Employment is given to 145 men during normal operations.†

Major markets for the plant's output are in the southeastern states, direct shipping facilities being offered by the Pikeville branch of the N. C. & St. L. Ry., which serves Richard City. Junction points with the Southern Railway and other systems are Stevenson, Ala., and Chattanooga. Shipments are also made via the Tennessee River, 8427 bbl. being shipped to Chattanooga markets by this route in 1931.

A. E. Legg is superintendent.

Kingsport

Limestones and marbles of Ordovician age are used, being shipped six miles, via the Clinchfield and the Southern Railways, from a quarry at Marcem, Va. The quarry at this place has a face 2000 ft. long in which are exposed three types of calcareous strata. Two of these are limestones; one is a semi-lithographic limestone of dove gray color, and the other is a coarsely crystalline crinoidal limestone of medium gray color. The third type is a coarsely crystalline marble which varies from light to deep pink. An average analysis of these materials is given in the accompanying table.

The stone is crushed at the quarry to 3-in. size, by 36-in. Superior-McCully and No. 6 Allis-Chalmers gyratory crushers in tandem arrangement, and is shipped to the plant in steel railway gondolas. Present costs of stone haulage may be materially reduced in the near future by quarrying limestone at a point nearer the plant. An area two miles east of Kingsport, along the Clinchfield Railway, contains suitable limestone and is being considered by the company as a site for a new quarry.

A high ridge, lying between the plant and Holston River, supplies the shales. This ridge, rising to a height of over 100 ft., is composed almost entirely of hard, massive slate-gray shales of Ordovician age (Sevier horizon). The shales have a high dip to the southeast and are cut by a strong northeast-southwest system of fracture joints.

The quarry face, several hundred feet in length, and trending roughly south, averages 25 ft. in height. No overburden is encountered in present operations as the top of the quarry face intersects the floor of former quarry operations at higher levels. Blasting is necessary to the removal of the shale, and holes are drilled by well drills at intervals of 20 ft. apart and 15 ft. back from the face. The usual charge in each hole is 150 lb. of 40% dynamite which is fired by 110-volt current.

The broken shale is loaded by an Erie traction-type steam shovel and hauled to the crusher house in side-dump cars pulled by a gasoline locomotive.

Primary crushing of the shale to 3-in. size is done by a 12-in. Allis-Chalmers gyratory crusher. Excess moisture is expelled from both stone and shale by three small rotary driers. Secondary crushing of stone to ½-in. size is accomplished by a "Jumbo" hammer mill; a "Williams" hammer mill reduces the shale to a similar dimension. The hammer mill products are automatically fed to a belt system in the "raw mix" proportions of 75% stone to 22-23% shale; 2-3% Holston River sand is usually added to complete the necessary silica content of the mix.

A "Hercules" mill reduces the mix to ⅛-in. or lesser sizes. Allis-Chalmers tube mills complete the pulverization, reducing the mix to 200-mesh fineness. The dry process is used.

Six Allis-Chalmers kilns, 8 ft. by 125 ft., fired with pulverized coal, sinter the mix. The coal used in the kilns is obtained from Dante, Va., mines.

The clinker, with 4% of gypsum added, receives a primary grinding to 20-mesh in Bradley mills; all over-size clinker, too large for the mills, is first crushed by rolls. Final grinding to a fineness of 90% through 200-mesh is accomplished by A-C tube mills.

The Kingsport mill has a daily capacity of 4000 bbl. The output is distributed mainly to markets in southwestern Virginia, western North Carolina, and the eastern parts of Tennessee and Kentucky. Shipments are made by the Clinchfield Railroad.

The plant furnishes employment to 130 men. Felix Guenther, Jr., is general superintendent.

Chattanooga

From 1923, when the Signal Mountain plant was established, to, 1930, all limestone was secured from an open quarry. Underground mining was begun in 1930, and it has

AVERAGE* ANALYSES OF RAW MATERIALS USED BY TENNESSEE CEMENT PLANTS

	Limestones and Marbles						Clays and Shales					
Plants	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Ign. Loss	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Ign. Loss
Penn.-Dixie, Richard City	1.22	0.28		54.14	0.93	43.36	52.58	16.24	5.64	6.82	3.12	13.35
Penn.-Dixie, Kingsport	4.03	0.90	0.46	52.00	0.97	40.61	34.80	13.55	3.89	22.00	1.97	20.16
Signal Mountain, Chattanooga	3.2	1.4		51.8	1.8	42.0	63.2	17.1	6.8	1.6	0.9	9.1
Hermitage, Nashville	3.5	1.5	1.0	47.5	2.5	44.0	65.0	15.0	3.0	2.0	....	15.0
Cumberland, Cowan	7.76	0.95	0.69	48.83	1.41	39.88	65.84	16.44	6.60	1.17	0.84	8.65
Volunteer, Knoxville:												
Chickamauga Limestone	6.90	2.35	1.02	49.40	0.65	39.00	68.60	14.75	5.95	0.25	2.00	5.38
Holston Marble	0.60	0.30	0.60	54.80	0.45	42.60						
	0.50	0.40	0.40	55.20	0.25	42.60						

*Analyses supplied to the writer through the courtesy of officials of each plant.

†The figures given in this article of number of men employed refer to hours of labor antedating the application of the Cement Industry's code; the code requirements will necessitate the employment of probably 15 to 20% more.—The Editor.

proved a successful venture for this plant. The additional cost incurred by this new system of stone removal is offset, according to the plant officials, by (1) cleaner stone with attendant better control of raw mix, (2) non-existence of overburden problems and costs, (3) all-year working conditions, and (4) protection of workmen from heat and cold which results in increased efficiency and output.

The plant is approximately 6 miles northwest of Chattanooga alongside the base of Signal Mountain, on the north side of Tennessee River. The old quarry from which the limestone was formerly secured is about one-half mile northwest of the plant. The face, over 1000 ft. in length, trends roughly northwest and exposes 20 to 180 ft. of limestones belonging to the Upper Chester series of the Mississippian system. The upper and lower sections of the face contain dark gray massive semi-lithographic limestones which average about 80% calcium carbonate. Between these dark gray limestones is 60 ft. of whitish-gray massive sub-crystalline limestones which analyze around 90% calcium carbonate.

Two tunnel entries, driven into each end of the quarry face, open into the mine which was begun in 1930. The entry at the southeast end of the face penetrates only the lower, dark gray limestones, but the other entry, due to a 6½-deg. dip of the strata to the northwest, penetrates both the lower gray and the whitish-gray limestones. The room and pillar system of mining is used, the rooms being 40 ft. in width and 50 ft. in height. Present operations have carried two rooms at each entry into the mountain for an average distance of 250 ft. With the progress of mining operations, cross entries are to connect the workings now being developed at each entry. Pillars, 35 ft. square, are left as roof supports at intervals of 50 ft.

The multiple-bench system of underhand stoping is practiced in mining the limestone. The average depth of each bench is 10 ft., although this varies according to the height between bedding planes of the strata. Blast holes are drilled by air drills and charged with 50% dynamite. Firing is done by spark coil and battery. Bucyrus 1¾-yd. and 1½-yd. Marion electric shovels load the stone on side-dump cars which are hauled to the plant by 55-ton locomotives. The mine is required to produce daily 800 to 900 tons of stone to meet the needs of the plant under present operations.

A brown sandy alluvial clay, stripped by power shovel from a nearby pit in the flood plain of Tennessee River, supplies the argillaceous portion of the raw mix. The plant is equipped largely with Allis-Chalmers machinery which is electrically operated. Primary crushing is done by a 42-in. gyratory. Secondary crushing to ¾-in. size is accomplished by two Williams hammer mills. The clay is blunged with water to a slurry and held in a storage sump until needed. Wet grinding of the raw mix, 80% stone to 20% clay, is done by a battery of four combination ball and tube mills. The product of the mills has a moisture content of 33-34% and a fineness of 90% through 200-mesh. Nine storage tanks, each of which has a capacity of 1500 bbl., receive this finished slurry. Pumps charge the slurry to three 11-ft. by 175-ft. kilns, which are fired with Tennessee or Kentucky coals.

AVERAGE ANALYSES OF RAW MIXES USED BY TENNESSEE CEMENT PLANTS IN 1931*

Plant and Location	$CaCO_3$ %	SiO_2 %	Al_2O_3 %	Iron Oxides %	$MgCO_3$ %
Penn.-Dixie No. 3, Richard City.....	76.67	12.86	3.20	1.40	5.09
Penn.-Dixie No. 1, Kingsport.....	75.66	13.87	4.48	1.73	3.11
Signal Mountain, Chattanooga.....	76.20	13.80	3.70	1.50	3.60
Hermitage, Nashville	76.00	14.00	4.00	1.80	4.20
Cumberland, Cowan	78.57	13.00	3.74	1.26	2.84
Volunteer, Knoxville	79.00	14.00	5.90	2.10	.80
Average	77.01	13.58	4.17	1.63	3.27

*Data through the courtesy of Tennessee Division of Mines, Nashville.

The clinker discharges directly from the lower ends of the kilns into storage pits. The clinker pits, as well as others for clay, gypsum, stone and coal, are arranged in a straight line and are served by two traveling cranes equipped with clam-shell buckets. Gypsum and clinker from the storage pits are fed into the hoppers of a battery of four combination ball and tube mills. Finished cement with a fineness of 90% through 200-mesh is produced by these mills.

The plant furnishes employment to 94 men and has an annual capacity of 1,600,000 bbl. The principal markets for the product are in Tennessee, Georgia, North Carolina, and South Carolina; some shipments are made into Kentucky. Shipping facilities are supplied to the plant by the Southern Railway.

R. S. Conner is superintendent.

Nashville

The Hermitage Portland Cement Co., at Nashville, manufactures both ordinary gray portland cement and masonry cement. The latter product, resulting from two and a half years of research in the laboratories of the company, has just recently been introduced to the trade under the name of "Hermitage" masonry cement. Quick-hardening with the retention of plasticity and reduction of losses by droppage in laying up masonry work are features claimed for the new cement.

The Hermitage plant, established in 1924, is near North First Avenue on the south alluvial terrace of Cumberland River. Most of the limestone used at the plant is obtained from a quarry in the low-lying limestone hills which bound the terrace on the west. This quarry, approximately one mile northwest of the plant, exposes 60-70 ft. of thin-bedded, dark gray, crystalline limestones of Ordovician age (Trenton series). The face is roughly 1000 feet in length, trends northwest, and is capped by only a few feet of clay overburden. The dip of the strata is low, the beds lying essentially horizontal.

Blast holes are drilled with an electric well drill to an average depth of 53 ft. and are spaced at intervals of 20 ft. along and 14 ft. back from the face. The usual charge in the hole is 60% dynamite in the bottom and 40% dynamite at the top. Firing the charges is done by battery. A Marion 1-yd. electric shovel loads the stone into wooden side-dump cars. These are hauled to the plant by steam locomotives over standard-gauge track.

The remainder of the stone utilized by the plant is also of Ordovician age and is obtained from a company-owned quarry at Mimms, Tenn., approximately nine miles southeast of Nashville. The quarry face, about 1100 ft. in length and trending nearly due east and west, exposes 60-70 ft. of dark gray, dense, semi-lithographic limestones lying in beds which are moderately massive in the upper 45-55 ft., but which become comparatively thin-bedded and somewhat shaly in the lower 15 ft. The dip of strata is low, being around 1 to 2 deg. to the southwest. The rock is shot from the quarry face by blasting and loaded directly into standard railway gondolas by a Marion 1¼-yd. electric shovel. Haulage to the point is via the N. C. & St. L. Railroad.

River alluvial clay is used. It is obtained from a pit about one-half a mile northeast of the quarry, the pit being worked jointly by the cement company and the nearby W. G. Bush Brick Co. An electrically operated "Wiley-Whirley" dragline with a 40-ft. boom and 2½-yd. bucket strips the clay to depths of 10 to 12 ft. Haulage to the plant is over standard-gauge track.

Practically all equipment of the Hermitage plant is of Allis-Chalmers design and is electrically operated.

Primary crushing by a No. 18 gyratory crusher reduces the stone to 6-in. or lesser sizes. A revolving scalping screen returns over-size to the crusher; the sized stone is given a secondary crushing to 2-in. size by two No. 5 gyratory crushers. A "Pennsylvania" hammer mill further reduces the stone to a fineness of 20-50% through 20-mesh. The product is sent by conveyor belts to the feed hoppers of two "Compeb" mills; the slurry produced by these mills has a 31½% moisture content and a fineness of 93-95% through 200-mesh. Eight storage tanks, having a combined capacity of 7000 to 8000 bbl., feed the slurry to two correction tanks where the chemical composition of the mix is adjusted. The corrected slurry is fed to two 10-ft. by 150-ft. kilns, discharg-

ing into two 8-ft. by 60-ft. rotary coolers. The cooled clinker drops into concrete pits from which it is carried to the grinding plant by locomotive cranes equipped with 2-yd. buckets.

Primary crushing of the clinker is done by one closed-circuit type "Compeb" mill, the product having a fineness of 70% through 200-mesh. Finish grinding to a fineness of 97% through 200-mesh is accomplished by two "Compeb" mills; a bucket elevator carries the product of the primary grind to these mills. Screw conveyors elevate the finished cement to storage silos.

The plant has a daily capacity of 2500 bbl. Most of the output is distributed to Middle Tennessee markets. Shipments are made over the T. C., N. C. & St. L., and L. & N. railroads.

Approximately 100 men are employed by the plant. Tennessee and Kentucky coals are burned in the kilns.

Fredrick Stugard is plant manager and superintendent.

Cowan

The Cumberland Portland Cement Co.'s wet-process plant was the third plant in the United States to manufacture a white portland cement, and the only plant in the South making this product. The white clays used in the production of the white cement were obtained from mines in West Tennessee near Paris (Henry County). The white cement, however, proved unprofitable, and its manufacture has since been discontinued. "Cumberlite," a new type of masonry cement with non-staining features, has recently been perfected and introduced to the markets by the Cowan plant.

The limestones utilized by the "Cumberland" plant are obtained from a quarry 500 yd. east of the mill at the base of a moderately high ridge—one of the foot-hills of the Cumberland mountains. The quarry face, striking roughly northwest, is 1800 ft. in length and exposes 75 to 100 ft. of limestones of the Upper Chester series (Mississippian system). The topmost beds in the quarry are white, finely crystalline and oolitic limestones of the Gasper horizon. The remainder of the exposed face is composed of limestones of the St. Genevieve formation. With the exception of a white, finely crystalline 22-ft. bed which occurs approximately 40 ft. above the quarry floor, the St. Genevieve is composed of greenish to bluish-gray, thin-bedded, more or less argillaceous limestones of semi-lithographic to coarsely crystalline character. Some of the lowermost beds of the St. Genevieve contain as much as 14% magnesia; these beds are not, however, being used for making cement. The Gasper is a very much purer limestone than the underlying St. Genevieve.

Blast holes are drilled at the Cumberland quarry with an Armstrong electric drill, the average depth of drilling being about 90 ft., or to a depth 5 ft. below the quarry floor. The holes are spaced 20 ft. apart and 28 ft. back from the face. Bottoms are loaded with 75% nitro-gelatine; tops and secondary tops are charged with 40-50% nitro-starch. "Cordeau-Bickford" detonating fuse is used in firing the charges. On November 17, 1932, this quarry made a 10-ton shot which moved 80,000 tons of stone.

The stone is loaded by a ¾-yd. Marion electric shovel into 6-yd. wooden side-dump cars. Haulage to the plant is over standard-gauge track by Shay-type locomotives.

The clay used by the Cowan mill is obtained by power shovel from shallow pits a short distance southwest of the plant. The clay is a residual type derived from limestone and contains considerable quantities of fragmental chert and silicified fossils. These impurities are removed by blunging the clay with water in a "mud-mill." The clay-water slurry from this mill is stored in a tank until needed.

The plant is equipped largely with Allis-Chalmers machinery, electrically operated. A 42-in. gyratory crusher reduces the quarry stone to 4-in. size. Secondary by two "Newhouse" Type B gyratory crushers, arranged in tandem fashion, produces ¾-in. to 1¼-in. sizes, the product going to stock piles. A 5-ton Shephard traveling crane and bucket serves the stock piles of stone, clay, coal, gypsum, and other raw materials.

Two compeb mills wet-grind the raw mix. The stone and clay-water slurry from the "mud-mill" are gravity fed into the mills. The finished raw mix has a composition of 80% carbonates and 20% clay, a moisture content of 36-38%, and a fineness of 85% through 200-mesh. It is stored in eight 1000-bbl. tanks.

The slurry, its composition adjusted chemically by drawing definite portions from storage into a 1200-bbl. feed basin, is fed to two "straight-wall" 10-ft. by 150-ft. kilns. An increased efficiency of 200 bbl. daily has been obtained by the installation of five rows of "Pyrasteel" mud lifters in the charging end of each kiln. Pulverized coal, obtained as nut and slack grades from Tracy City, Tenn., is burned in the kilns.

Twenty buckets of clinker to one of gypsum, all handled by the Shephard crane, are fed to two compeb mills which finish grind. A fineness of 85% through 200-mesh is maintained. Air pumps and bucket elevators convey the cement to storage silos.

The plant has a daily capacity of 2500 bbl. and employs 107 men. The output is distributed, via the N. C. & St. L. Railroad, to markets principally in east and central Tennessee. Kentucky, North and South Carolina, Georgia, Alabama, and Mississippi Markets also absorb a part of the production.

A. J. Turner is plant superintendent.

Knoxville

The Volunteer mill uses limestones, marbles, and shales of Ordovician age in their product. These materials are all obtained from a quarry approximately one-half of a mile south of the mill, the east end of the quarry being 200 yd. from the west bank and 40 ft. above normal water level of Holston River. The quarry face is very irregular in outline but extends roughly east and west. Present operations over 600 ft. of face reveal 60 to 75 ft. of badly folded and faulted beds of dark gray crystalline limestone of the Chickamauga horizon and white to dark red coarsely crystalline marble of the Holston formation. All the beds are massive in character, have steep dips, and are cut by intersecting systems of major fracture joints. There is practically no overburden above the quarry, the upper edges of the tilted strata being largely exposed as a rough, bare surface. Mud seams, some of which are large and extend down to the quarry floor, are common. These mud seams cause considerable variation in the composition of the raw mix, necessitating accurate and close chemical control.

Two hundred yards north of the limestone quarry is the shale pit. The shale obtained here is reddish-brown, very ferruginous, and decidedly siliceous. It is thin-bedded with the strata standing nearly vertical. As measured horizontally across the strike, this shale, probably a part of the Sevier horizon, has a thickness of 75 to 100 ft. and is succeeded to the north by an alternation of gray shales and thin, shaley limestones. At present, only the reddish-brown shale and its residual clay are utilized by the plant. The shale is fairly soft and is removed by power shovel from a 30-40-ft. face.

Blast holes in the limestone quarry are bench drilled with air-driven jack-hammer drills. Well drilling was formerly practiced, but it has been abandoned, due to difficulty of moving the rig over the rough surface above the quarry. This change in drilling methods and the development of a circular loading-track system, in the last seven months of 1932, reduced quarry costs approximately 40% as compared with costs in previous years. In drilling, the holes are spaced 10 ft. apart and 8 ft. back from the face. They are charged with 40% dynamite which is fired electrically. The broken stone is loaded by power shovel into 11-ton side-dump cars which are hauled by gasoline locomotive over standard-gauge track to the crusher.

The contents of quarry cars are dumped by compressed air into a 36-in. McCully gyratory crusher which gives a primary reduction to 6-in. size. Secondary crushing is done by two Pennsylvania hammer mills; reduction is to ⅝-in. or lesser sizes. The mill receiving shale has a grizzly in advance of its hopper, and this permits only the larger pieces of shale to pass through the mill. The crushed materials are delivered to storage bins over belt conveyors.

By an automatic belt-feed system, shale and limestone are drawn in raw mix proportions from storage and sent to two Smidth wet-grinding compartment tube mills. Water, pumped from Holston River, enters the mills with the raw materials. These mills produce a finished slurry of 36% moisture content and fineness of 90% through 200-mesh. Finished slurry is held in three

621-bbl. silo-type correcting tanks, specially built.

Chemical control of the mix is effected by drawing calculated amounts of slurry from one or more of the silo tanks into an 1800-bbl. agitating tank. After thorough mixing in this tank the slurry is pumped into a 7500-bbl. storage basin from which it is automatically fed to two 10-ft. by 215-ft. kilns fired with pulverized coal, the weight of the coal consumed being recorded automatically. The clinker discharges into an 8-ft. by 100-ft. rotary cooler, equipped with a ball chamber to crush all over-size clinker. A Torpedo oscillating conveyor carries the clinker to storage.

Clinker and gypsum are fed to two 20 by 39 Smidth ball mills, grinding to a fineness of 91% through 200-mesh.

The plant has a daily capacity of 3000 bbl. During normal operations 140 men are employed.

The principal markets are in Tennessee, the Carolinas, Georgia and Virginia. The plant has direct switching facilities to the Southern and L. & N. railroads.

C. F. Lewis is manager.

Acknowledgments

In the preparation of this paper, the writer has obtained both incentive and material aid from various publications bearing upon the cement industry of Tennessee. This assistance is acknowledged in footnotes of the text. The bulk of the information, however, was secured through personal visits to the plants. To the officials of each of these plants, the writer wishes to express his deepest appreciation of their courtesy and hearty co-operation; they did much to make this survey a very pleasant task, and their criticism of this manuscript has been most constructive. To Walter F. Pond, state geologist, the writer is particularly indebted for the arrangements that made this survey possible and for permission to publish the results that were obtained.

Effects of "Compulsory Cartel Law" on German Cement Industry

THE so-called "compulsory cartel law," issued July 15, 1933, among other things authorized the Minister of Economics to regulate in the interests of the common welfare the degree of utilization of the capacity of firms in a given branch of business; to forbid the expansion of this capacity; to forbid the establishment of new firms; to join firms together in new cartels; or to compel them to join already existing cartels. This law places the German Government in a position to intervene in those cases where conditions in a given branch of industry are generally regarded as economically unsound and private attempts at regulation have failed to produce satisfactory results.

With regard to the cement industry, which is at present operating at about 30% capacity, the Government has now taken the initial steps to bring about a regulation of production which shall adequately relate production of the already established firms to the present and future demands. It is the desire of the Government to work out this regulatory system in co-operation with the industry, but the plan which is finally decided upon is likely to be put into effect by Government decree. In accordance with this policy, the Minister, after discussing the general situation with the heads of the four syndicates (3 regional and 1 technical), has asked them to present to him definite proposals for an agreement which would bring about a greater degree of co-operation between the syndicates and the outsiders, and which would make possible a more rational division of such new business as may arise, and would prevent ill-advised erection of new factories or expansion of already existing works to take advantage of temporary increases in business.

It is believed probable that when suitable regulations have been worked out, the outsiders will be compelled to join one or the other of the four cartels, depending on the location and type of product of the firm in question. A greater degree of co-operation between the syndicates will be required, but it is probable that no attempt will be made to consolidate them in a single cartel, as differing regional economic and technical conditions are believed to make the separate, but co-operative, existence of 4 cartels more desirable than their complete fusion in 1 unit.—*United States Commerce Reports.*

Phosphate

Tennessee: Another large phosphate company resumed operations recently, making four out of the seven plants in operation. None of the large phosphate companies have as yet gone under the eagle of N.R.A., as their code is still being worked out in New York, and the few small miners who have taken eagles are operating under the blanket code, increasing wages 20%. The fact that the yearly payroll increase of the city of Columbia, not including any of the phosphate companies, amounts to $244,000, indicates the possibility of enormous business revival, whenever the phosphate companies again resume anything like full operation and come under the N.R.A. provisions. As production of phosphate during 1932 and '33 has dropped down to the lowest level of volume since 1897 and the lowest level of value since 1898, it can be easily seen what a vast room for improvement exists in that line. The new low rates being promulgated by the Tennessee Valley Authority, starting at a maximum of 3c per kw. for first 50 kw.-h. and dropping down to 4 mills for large quantity users, will undoubtedly cause a large influx of industrial power consumers, and make more than ever before attractive the establishment of phosphate manufacturing operations at the source of raw material, and this will be still more attractive when the development of the Duck and Elk river power, provides water navigation to every part of the great Mississippi Valley. The phosphate business needs newly prosperous farmer customers to actualize the enormous potential demand, and farmers need phosphate to enable them to pursue a properly planned agriculture in which while actually reducing the total production of grain, they will so greatly reduce the cost of production, by increased acre yields, as to be prosperous even from present prices, and all the more so from increased prices sure to come.

Cement

Japan's Cement Industry is the subject of 12-pp. rotogravure section of *The Osaka Mainichi* for August 10. The articles contain much statistical information and much publicity material on concrete construction in Japan.

Recommended Wire Diameters for Mineral Aggregate Production Screens

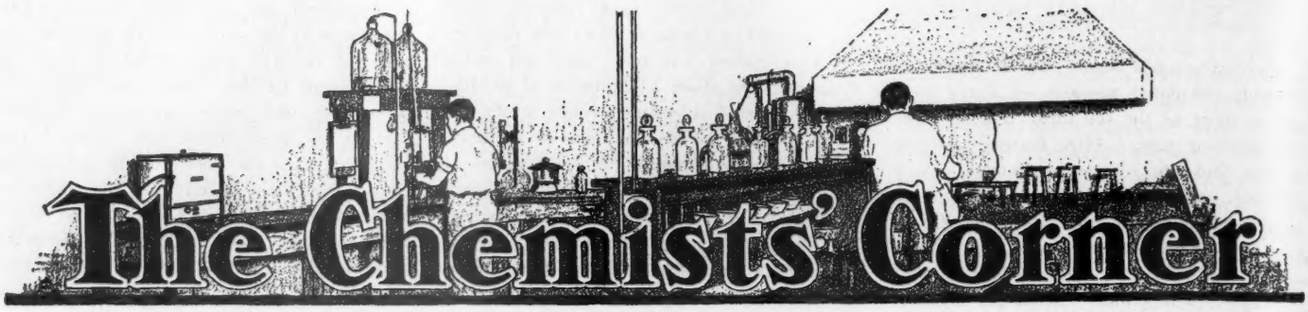
SIMPLIFIED PRACTICE recommendation R147-33 covering wire diameters for mineral aggregate production screens, is now available in printed form, according to an announcement by the division of simplified practice of the U. S. Bureau of Standards.

The recommendation, which was proposed and formulated by members of the industry, provides for the width of clear opening, and the diameter, in inches, of light, standard light, standard heavy and heavy wire used for screens in production of mineral aggregates. This simplification program will effect a reduction of approximately 75% in the number of wire diameters formerly used.

Copies of this recommendation may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 5c each.

Sand and Gravel

Southern California Rock Products Association and the Rock Products Code Association of Southern California have complained to the county supervisors at Santa Ana, Calif., the operation of a new rock plant near Orange will handicap them seriously. As a basis of their complaint the two organizations said that there are enough such plants in the county to meet all needs and that another would make it difficult for the existing companies to conform to requirements of the N. R. A. They request that the supervisors adopt an ordinance requiring a license before a new plant may be built.



The Steam Test of Portland Cement Mortar Briquettes

By A. E. Hiscox

SINCE the day when portland cement first became a material of construction, we have been concerned with the durability of the concrete in which it is incorporated. The materials of which concrete is made vary widely in their properties and portland cement especially affords no exception. Although only a negligible quantity of the portland cement manufactured today will fail to comply with the requirements of the standard specifications of a particular country, there is a decided lack of uniformity of color among the various brands; some cements are more resistant to the action of sea water than others; some will show a marked tendency to stain structural stone; again, one cement is said to possess a superior plasticity, or to develop a more rapid rate of hardening, or, when gauged with water, to generate more heat than some other cement.

One or all of the merits claimed for particular cements may be readily established. Nevertheless, we are primarily interested in the enduring qualities of the concrete, of which the cement is the most important ingredient. It is a fact that even though very few cements fail to meet the requirements of the existing standard specifications, when they are used in concrete their reactions are oftentimes very dissimilar.

Any property of portland cement, therefore, which apparently has some bearing upon the durability of the concrete is well worth investigating.

This article is descriptive of a series of comparative tests of several brands of American portland cements taken from the open market, as well as tests of numerous samples of the same brand. All samples were first tested for conformity with the standard specifications of the American Society for Testing Materials, and it may be said at this point that the number of samples failing to meet these specifications was negligible. In addition to these routine tests, others were made, the principal one of which originated from the study of a case of disintegration of some concrete test specimens that had been held in boiling water for a short period. This test, described below, consisted of the steaming of mortar briquettes at the age of seven days.

The mortar briquettes were molded in the usual manner. The standard proportion of one part of cement to three parts of Ottawa testing sand was used and the water-cement ratio was determined, of course, from the normal consistency test. For each sample of cement tested half of the total number of briquettes made were stored in moist air and water at 70 deg. F. for the entire period of seven days. The other half were stored in moist air and water at the same temperature and for the same length of time except during the last five hours of the test period. During these final five hours they were subjected to the steaming test in the regulation cement pat boiler at 212 deg. F., then cooled to room temperature and broken in the tensile machine simultaneously with those that had been stored in water and moist air for the entire period of seven days.

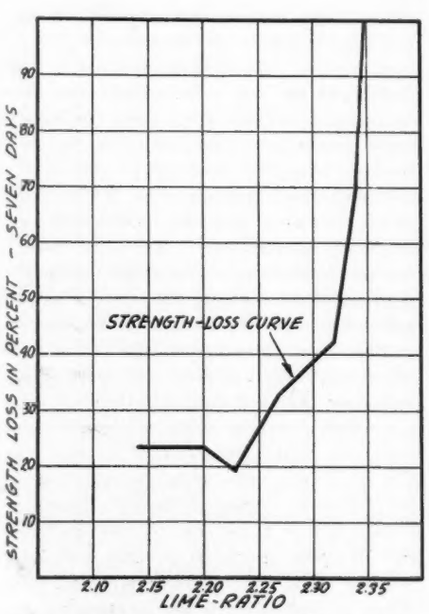


Fig. 1. Curve showing relation of lime-ratio to strength loss

The seven-day period has been arbitrarily chosen for this work, because modern practice, both of consumer and manufacturer, demands test results as quickly as possible. A three-day test was first attempted, in order to be able to reduce this time interval, but the results were so erratic and difficult to repeat that the seven-day test was decided upon. The tensile strengths shown are averages of at least two sets of briquettes, six specimens to the set, made on different days but by the same operator. It was felt that such a procedure would give more average and dependable results.

Brings Out Differences Between Different Brands

The results revealed such a great difference in the resistance offered to the action of the steam by different brands, as well as different samples of the same brand, that an effort has been made to give the test some practical value. From the manufacturer's standpoint, it is believed that this test can be applied with good results to the control of the manufacturing process. It is hoped later on to tie in the result of the steaming test of various cements with those qualities that are desirable in concrete.

Table I shows the tensile strength in pounds per square inch at seven days, with and without steaming. The brands of cement are identified throughout the article by letter.

TABLE I—TENSILE STRENGTHS WITH AND WITHOUT STEAMING

Brand of Cement	Tensile Strength—7 Days Not steamed	Steamed	Percent loss of strength
A	351	307	12.5
B	359	275	23.4
C	360	317	11.9
D	329	263	20.1
E	402	327	18.6
F	336	223	33.6
G	314	47	85.0

It should be remembered at the outset of this discussion that the sample of each of these seven brands tested fully complied with

the requirements of the standard specifications of the American Society for Testing Materials. All of the seven brands are marketed as standard portlands.

The feature of these tests which stands out is that all brands show some loss of strength after steaming. Since the original tests of these seven brands were made, a large number of additional "grab" samples of different brands and consecutive samples of the same brand have been subjected to this test but not one showed a *gain* in strength at seven days. Several, however, showed a loss of as low as 3%.

In casting about for an explanation of this varying strength loss of different cements, the compound composition of each was carefully studied. No relation could be deduced from the compound analysis so all data of this nature are omitted. Also, as could be expected, there was no relation between the fineness to which these cements had been ground, as represented by the residue on the 200-mesh sieve, and the loss of strength. Table II shows the range of fineness and for this reason is included:

TABLE II—RANGE IN FINENESS OF CEMENT

Brand	A	B	C	D	E	F	G
Percent residue—200 mesh	5.5	13.8	13.2	10.3	10.4	6.6	6.7
Percent strength loss	12.5	23.4	11.9	20.1	18.6	33.6	85.0

At first thought the theory might arise that this loss of strength would be proportional to the amounts of free or uncombined lime in the cements. Table III shows the free-lime content of these seven cements. There is no relation at all between the *quantity* of free lime present and the strength loss at seven days. Cement G is seen to have an abnormally high content of uncombined lime, but in view of the lack of any relation between the percentage of free lime and the strength loss of the other six samples, the high strength loss of Cement G cannot be attributed to this one factor only. In further studies of many other samples, data on which are not here included, this lack of any definite relation between the free-lime content and the strength loss was fully verified. As a further illustration there is given the test data on two samples of the same brand "P":

Sample Number	Free lime percentage	Tensile strength—7 days Not steamed	Steamed Disintegrated
P-1	2.1	330	232
P-4	2.5	328	

In Table III, also, the chemical composition of the seven cements is indicated by the so-called "lime-ratio." By this term is meant the quotient obtained by dividing the percentage of total lime, CaO, by the combined percentages of the oxides of silicon, iron, and aluminum, SiO_2 plus Fe_2O_3 plus Al_2O_3.

TABLE III—LIME RATIOS AND PERCENTAGES OF FREE LIME

Brand	A	B	C	D	E	F	G
Lime-ratio	2.21	2.09	2.06	2.14	2.16	2.31	2.34
Percent free lime*	2.1	0.8	1.1	2.3	1.0	2.4	4.2
Percent strength loss	12.5	23.4	11.9	20.1	18.6	33.6	85.0

*The free lime determinations were courteously made by the Bureau of Standards, Washington, D. C.

From Table III, the lime-ratio would seem to affect the strength-loss only when a ratio of approximately 2.30 is exceeded. This is somewhat misleading as the maximum lime content that any one mill can carry in its product is largely fixed by conditions over which the chemist has little or no control. In Fig. 1, with accompanying Table III-a, there is shown graphically the effect of a changing lime-ratio upon the strength loss of a large number of samples of the same brand, which we have designated as brand "M." These samples were picked up from a state-wide market over a period of six months. For this particular brand of cement, it is evidently both advisable and necessary to carry a lime-ratio which is, as a rule, regarded as abnormally high. On the strength loss curve, it is seen that after a lime-ratio of 2.20 is passed there is an abrupt drop at a ratio of 2.23. From this it can be concluded that for that particular mill, with a fixed ratio of 2.23, the ease of processing would be materially helped and a better quality in the product insured. From a 2.23 lime-ratio upward, the tensile strength slowly recedes and the strength loss rapidly increases; in fact, the strength loss increases at a much more rapid rate than the routine tensile strength falls away.

Later on in this article there will be a discussion of the application of these data to process control.

In the course of these studies, two samples of the same brand of cement were encountered, both of which fully met the requirements of the standard specification, but showed such radically different reactions to the steaming test that it seems worth while to record the complete results here:

TABLE IV—RADICALLY DIFFERENT REACTIONS FROM SAME BRAND (BRAND "O")

Chemical analysis

Sample	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	SO_3	Loss
O-5	20.24	4.36	2.66	65.19	2.97	1.77	2.40
O-6	20.12	4.70	2.70	64.92	3.00	1.99	2.12

Physical tests

Sample	Residue 200-Mesh	Setting time Initial	Final	Soundness	Normal con's'y	Tensile strength 3 days	7 days	28 days
O-5	5.2	4:45	7:37	OK	24.5	293	312	398
O-6	4.4	4:34	7:37	OK	24.5	313	367	390

7-Day steam test

Sample	Not steamed	Steamed Disintegrated	Percent loss
O-5	312		100.0
O-6	367	286	22.1

Repeated check tests were made on sample O-5 until the sample was exhausted and disintegration occurred in each case upon steaming the briquettes at seven days.

The tests outlined in Table IV raise the question: Are the present standard specifications adequate in revealing the durability of cement?

It may be mentioned here that samples 1, 2, 3, and 4 of brand "O" showed similar test results to those of sample 6. In some way sample 5 failed to coincide in quality with the "general run" of that brand.

TABLE III-A

Lime Ratio	Water Storage	Tensile strength—7 days Steamed	% Loss
2.14	336	257	23.5
2.20	357	273	23.5
2.23	356	287	19.4
2.25	351	257	26.7
2.27	347	233	32.9
2.32	338	197	41.7
2.34	323	104	67.8
2.35	317	0	100.0

Autoclave Test

An interesting relation came to light as a result of an autoclave test of these seven brands. The neat briquettes were put in the autoclave after being cured for 28 days in the usual manner. It is seen from Table VII that the loss of strength after autoclaving, with the exception of Cement G, varies somewhat inversely as the free lime content. In other words, as the free lime content decreases, for all cements except G, the loss of strength after autoclaving increases and vice versa. The results of this one test would tend to emphasize the lack of dependability of the autoclave test, which fact was first demonstrated about 1910 or 1911.

TABLE VII—AUTOCLAVE TEST AT 28 DAYS—NEAT BRIQUETTES

Brand	Percent free lime	Tensile strength Neat	Autoclaved	Percent loss
A	2.1	753	256	66.1
B	0.8	803	186	76.8
C	1.1	752	227	69.9
D	2.3	768	315	59.0
E	1.0	803	255	68.2
F	2.4	710	287	59.6
G	4.2	756	Disintegrated	100.0

Application of the Test

From the tests here given, it would appear that the loss of strength from steaming is due to expansive forces derived principally from the hydration of the free lime; the strength loss depends not primarily upon the *quantity* of free lime present, but rather upon the *rate* at which the free lime hydrates and the rate of hardening of the cement. The strength loss is to be regarded as a degree of unsoundness and a perfectly sound cement should therefore show no strength loss. To produce a cement which would show no strength loss, however, does not seem practicable because of the high cost of production. Furthermore, it does not seem necessary to use a cement showing no

strength loss in concrete to secure satisfactory durability; but it does seem advisable to limit this strength loss at some point. It is intended, in another series of tests, to ascertain the relation between the strength loss of cement and the quality of the resulting concrete.

For each mill there seems to be a maximum allowable percentage of free lime. When the free lime in the cement passes this safe maximum, the result is disintegration of the seven-day mortar briquettes after steaming. When the free lime is kept at a point below this safe maximum expansive forces are still set up, but their destructive action is somewhat balanced, depending upon the correctness of the composition and the care with which the cement has been processed. The strength loss may then be considered an indicator of the correctness of the designed composition and also of the efficiency of manufacture. For instance, Cement G has more than the safe maximum of free lime and consequently disintegrates in the steam test; Cement F has a free lime content that approaches the safe maximum for that particular mill, but this has been overcome to some extent by very hard burning; Cement B has a very low free lime content, comparatively, but still shows an appreciable loss of strength due to the fact that at that particular mill a uniformly correct composition is difficult to maintain.

The steaming test has a practical application to the process of manufacture. To prove this fact, through the cooperation of one mill, the test has been applied in actual mill practice. In the mill in question, for experimental purposes it was decided to hold this strength loss to a maximum of 18%. Inasmuch as the raw materials varied only slightly from day to day in their composition, the control factors of the raw mix were easily set and maintained.

The raw materials were ground to a predetermined fineness consistent with production requirements. The clinker was burned as uniformly hard as possible, there being little difficulty on this score as the coal used for fuel was of a high grade and other burning conditions were good. The fineness of the finished cement was held as close to a fixed standard as possible. After ascertaining the seven-day loss in strength for a given mix composition, the composition was adjusted, as were also some mill conditions, until the maximum loss of strength, 18%, was reached. The result was a decided improvement in the quality of the cement. For the mill by whose cooperation it was possible to make this test, a lime-ratio of 2.23 invariably resulted in less than 18% loss in strength in the steam test. The value of the test as a check upon the process can be seen. In following tables, the improvement in the quality of the cement can be readily undersood. In Table VIII there are shown seven days' run during which no attempt was made to utilize the steaming test as a corrective measure, or better, a yardstick. In other words, precedent was largely followed. In Table IX are shown results of tests.

TABLE VIII—TESTS OF DAILY RUN OF PRODUCT

Day	Tensile strength Not steamed	Steamed	Percent loss of strength	Lime-ratio
1	302	155	48.7	2.27
2	332	172	47.9	2.30
3	344	200	41.8	2.33
4	351	160	54.4	2.33
5	322	248	23.0	2.29
6	278	0	100.0	2.35
7	351	227	35.3	2 28

All of these cements in the above table passed the requirements of the standard specifications except the sixth day's run and on this day 8% of the hourly pats were slightly unsound. On the other six days there was no evidence of any unsoundness.

TABLE IX—TESTS FOR CONTROL OF MANUFACTURE

Day	Tensile strength Not steamed	Steamed	Percent loss of strength	Lime-ratio
1	351	288	17.6	2.23
2	339	283	16.5	2.23
3	368	322	12.5	2.22
4	361	307	15.2	2.25
5	398	328	17.6	2.23
6	413	344	16.7	2.22

Conclusions

In this article it has been demonstrated that a cement may meet all requirements of the standard specifications, yet fail on the mortar steaming test; it is probable that when complete failure occurs on the steaming test that poor concrete will result; and finally it follows that the degree of failure in the steaming test probably determines the degree of failure of the concrete, providing, of course, that all other factors entering into the making of the concrete are held to a satisfactory standard.

There are many gaps still to be filled in this study, but it is hoped that in a reasonable length of time the work can be completed and the relation of this test to the permanence of concrete shown.

Must Continue to Supply Statistics

WHILE the National Recovery Administration requires statistical information from industries in their certificates of compliance to codes, this fact does not relieve these industries from making their regular reports to other departments of the government, it was announced at headquarters Monday.

There has been some misunderstanding in this matter among manufacturers and others who are directed by law to make reports to the Labor Department, Commerce Department, Federal Trade Commission and other governmental agencies. The opinion has been entertained by some that by reporting to N.R.A. they need not report to the other departments. Attention is called to the regulations promulgated by the N.R.A. which provides "no provision of any code relieves any industry from the obligation of continuing to make customary statistical reports to government departments."

Lime for Water Purification

THE September 7 issue of *Engineering News-Record* has as its lead story: "Worst Water in the West Made Fit to Drink—Treatment of the silt-laden Colorado River water for the Boulder Dam builders involves all the problems of presedimentation, aeration, softening, recarbonation, filtering and chlorination—desert cloudburst causes turbidity of 150,000, which was conquered with lime and carbonation."

From a ton to 1½ tons of lime per million gallons of water treated is required, and from 10 to 19 million gallons are treated monthly—a market of about 15 tons of lime per month for this small community.

Better Housing Organization

THE National Association for Better Housing will hold its organization meeting at the Union League Club, Chicago, Ill., October 31 and November 1. J. Soule Warterfield, vice-president of the Starrett Building Co., is chairman of the organization committee. He believes that the administration at Washington will make favorable concessions to aid home-building projects. Of particular interest to the construction materials industries will be a summary of the various codes affecting materials, contractors, financial agencies and real estate.

Subjects rather than speakers will be scheduled. Out of an open discussion of matters of key importance is expected to crystallize a program of action.

Simplification and waste elimination all along the line in housing—construction finance, and sales—will be a principal field of activity for the association. Specific proposals directed toward cutting costs and improving dollar value of housing, now under consideration, include action to simplify and modernize local building codes and to secure legislation for licensing contractors. Slum clearance, and garden or subsistence homesteads will be thoroughly discussed by experts in this rapidly developing new field of housing.

Among the members of the organization committee are E. J. Mehren, president of the Portland Cement Association, and representatives of the lumber and brick industries. All interested are invited to attend. Henry A. Guthrie, 59 East Van Buren St., Chicago, Ill., is secretary of the association.

Fourteenth Exposition of Chemical Industries will be held in Grand Central Palace, New York City, the first week in December. The expositions are held every two years. They contain much of interest to lime, gypsum and cement manufacturers.

Rock Products News Briefs

General

Housing of a new kind may be the salvation of the rock products industries. For example, the most extensive housing project ever undertaken in Texas is being promoted here by the National Architectural & Engineering Co. E. M. Rabon, president, said the company would provide two-acre city farms for 1,500 families upon land recently reclaimed in the Trinity River bottoms by means of hydraulic fills and levees. The program calls for expenditure of approximately $5,500,000 and employment for more than 3,000 men for a year. The company has options on 6,000 acres from the Trinity Farm Securities Co. Parks, swimming pools, golf courses and other recreational facilities, as well as commercial centers, are to be provided. Paved streets, drainage, utilities and transportation between the farm and downtown Dallas are planned. Houses will be modern, with all conveniences. Residents will be given their houses, 200 hens, a cow and a horse or tractor, for $15 or $20 a month for three years. After 25 years the corporation must be liquidated.

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National Federation of Builders' Supply Associations has perfected a permanent organization. It is the plan of executive officers of the Federation to increase the number of state organizations throughout the country through the co-operation of metropolitan and local associations in sections which at present have neither regional nor state associations, with the objective of getting every building supply dealer of the country within the folds of the N.R.A. code. Walter F. Jahncke, Jahncke Service Co., New Orleans, La., prominent sand and gravel producer, is one of the three vice-presidents; John Prince, Stewart Sand and Material Co., Kansas City, Mo., past-president of the National Sand and Gravel Association, is a member of the Administrative (Code) Committee.

◆ ◆ ◆

N.R.A. publicity value is taken advantage of by a San Francisco, Calif., ready-mixed concrete producer, E. H. Peterson, president of the Readymix Concrete Co., Ltd., who breaks into print in part as follows: "Industry has been unable to correct its defects, to eradicate its ruinous, cut-throat practices and so the N.R.A., a centralized plan, is offered instead of a confusion of plans, divided responsibility and a lack of power to act, it is a weapon placed in the nation's hands, in your hands, and if properly used the battle is won, but if indifferently used the cause is lost and the indifferent user is a slacker.

"The N.R.A. as a plan is identical to that of the Readymix Concrete Co., Ltd. Readymix concrete is the product of a centralized plant, a controlled product precisely proportioned by weight from correctly graded and segregated clean aggregates, properly mixed and checked for workability and yield in a holding hopper before discharging into the agitator-mixer truck for transportation."

◆ ◆ ◆

National Safety Congress will be held in Chicago, Ill., October 2 to 6. A full and interesting schedule has been worked out for the Cement and Quarry (including Sand and Gravel) Sections. Among the speakers are David Adam, Lawrence Portland Cement Co.; A. J. R. Curtis, Portland Cement Association; Dr. C. H. Ogden, Illinois Steel Co.; A. R. Couchman, North American Cement Corp.; Wm. H. Baker, J. E. Baker Co.; C. E. Ralston, Pittsburgh Plate Glass Co.; J. B. John, Medusa Portland Cement Co.; Otho M. Graves, General Crushed Stone Co., and others yet to be announced.

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Recent Prices Bid

Milwaukee, Wis.: Twenty associated sand and gravel dealers whose bids were opened by the city purchasing board today reported increases averaging 70% on sand and gravel purchased during the remainder of the year. The increases are in line with the recovery code which has been accepted by the dealers. Only a nominal amount of sand and gravel is needed for the remainder of the year.

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Boulder Dam: Low bid for the largest contract yet to be offered for cement for Boulder Dam was $1.46 per bbl. The amount of cement sought is 1,000,000 bbl. The last contract, let to the same group of California companies after considerable price negotiation, was for 400,000 bbl. at $1.40. The companies bidding and the shares of the 1,000,000-bbl. contract proposed are: Riverside Cement Co. 300,000 bbl.; California Portland Cement Co., Colton, 300,000 bbl.; Southwestern Portland Cement Co., Victorville, 200,000 bbl.; Monolith Portland Cement Co., Monolith, 200,000 bbl. The bids have been forwarded to Washington for inspection of Secretary Ickes. If awarded, the contract will bring the amount of cement supplied by these companies to 2,067,500 bbl. and the total awards of cement contracts for the work to 2,175,000 bbl. It is estimated that after the present contract, about 2,600,000 bbl. of cement will still be required for the project. Previous contracts included 335,000 bbl. from the same mills in January, 1932, at $1.28 a barrel and 332,500 bbl. in September, 1932, at $1.24 a barrel.

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Columbus, Ohio: Contract of the Scioto Lime & Stone Co. canceled by city council, and Service Director William P. Halenkamp given authority to ask for bids on the plea of the Scioto company that the N.R.A. had increased its cost of operation. The Scioto company had a yearly contract to supply approximately 8,000 tons of lime for use of the city in purification of water. Approximately 3,000 tons of this were yet to be supplied. Council's action was unanimous.

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Toledo, Ohio: The Kentucky Asphalt Co. offered a bid on Kyrock at $8.50 a ton on cars at its plant in Bowling Green, Ky., on 5,000 tons of street resurfacing material and 5,000 tons of binder. Henry Gilroy offered a bid on the same material at $11.76 a ton delivered to railroad tracks in Toledo or $12.76 a ton delivered to the job. Bids ranged from $5 to $7 a ton on binder and from $5.50 to $11 a ton on resurfacing materials.

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Chicago, Ill.: The first move in about five years to obtain a fair margin on sales of building materials was made by leading dealers September 1 in revising prices upward 10c to $4 on the various items handled. New prices are effective today and are brought about by the N.R.A. code operation pending adoption of a code. In several cases higher prices at manufacturing plants as a result of approved codes are responsible for the increases. Dealers explained that higher plant production costs are the prime reasons for the advances. Cement prices are up 10 cents a barrel; prices on lime are approximately $3 a ton higher. The biggest advance seems to be on mason's cement which is increased about $4 a ton.

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Crushed Stone

Brotherhood of Quarry Workers, the union of the dimension stone employes is active in various crushed stone centers organizing, or attempting to organize these employes. There is no parallel in the two classes of workers. The dimension stone workers are skilled, the crushed-stone workers unskilled. The Quarrymen's International Union is another organization also busy organizing quarry employes.

◆ ◆ ◆

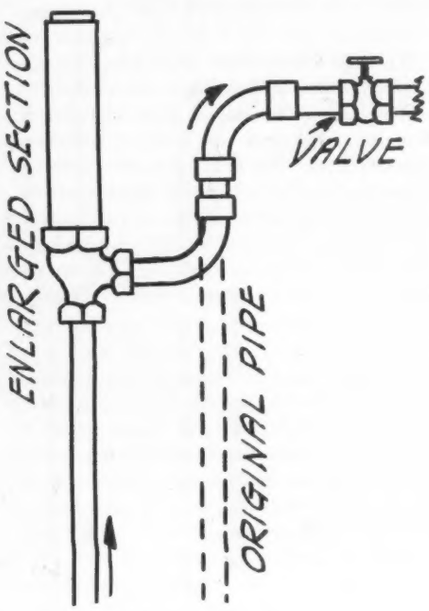
Tidewater Stone Co., Tarpon Springs, Fla., is installing complete washing equipment.

Hints and Helps for Superintendents

Preventing Water Hammer

IN a ready-mixed concrete plant or a cement products plant the flow of water to the mixer must be great while the material is being put in, but must be immediately shut off when the right consistency is obtained.

Because of the quick shutting off of such a large flow of water there is almost certain to be a heavy water hammer which will pound the pipe joints loose and jar the whole



Air cushion device

system. An air cushion to take up this shock can easily be added to the system with ordinary pipe fittings.

The drawing shows a mixer pipe which originally was connected from the lower floor of the plant directly to the valve at the mixer. A section was cut out of this pipe at a convenient point near its upper end, and a T was placed on the top of the vertical pipe as shown in the illustration. The T should be larger at its upper end than at the other two branches, which are, of course, standard size to fit the original pipe. If such a T is not available a regular one can be used with an enlarging section just above it.

The section of pipe with the T on it is then inclined slightly to give room for the connecting elbow from the T to the upper portion of the original pipe. Then a vertical section of larger pipe to fit the enlarged branch of the T is added. This large pipe should be about 18 in. long and well sealed at the upper end. In diameter it should be at least twice as large as the original pipe.

In operation, the large pipe is filled with air which is sealed in by the water passing through the T below. When the flow of the water is suddenly cut off there is an increase in pressure over that whole portion of the system and the water immediately rises in the large pipe against the pressure of the confined air. Thus as the air is compressed the shock of the water is dispelled. Then as the water pressure again drops the air expands to its normal size ready for the next compression.

The illustration shows the installation below the upper elbow of the original pipe. However, where there is enough head room the T can merely be substituted for the upper elbow.

Rock Yield Is 12 Tons Per Pound of Explosive

SEVERAL difficulties were successfully met in a recent tunnel blasting operation at the Union Portland Cement Co. quarry, Devil's Slide, Utah. The tunnel was 160 ft. above the quarry floor, while the extreme height of the blasted area was 375 ft. above the quarry floor. There was only 250 ft. of floor space between the toe of the quarry level and the crushing plant.

The accompanying sketch indicates how the 15,000-lb. charge was allocated and the breakage effected. As related in *Explosives Engineer,* the blast broke more than 180,000 tons of solid lime rock. The 15,000-lb. charge yielded approximately 80,000 cu. yd., making the consumption of explosives 0.19 lb. per cu. yd. Two electric blasting caps were used as primers in each of the four pockets shown. Quarry officials reported that more than 90% of the 180,000 tons of rock broken (12 tons per lb. of explosive) could be loaded without secondary blasting.

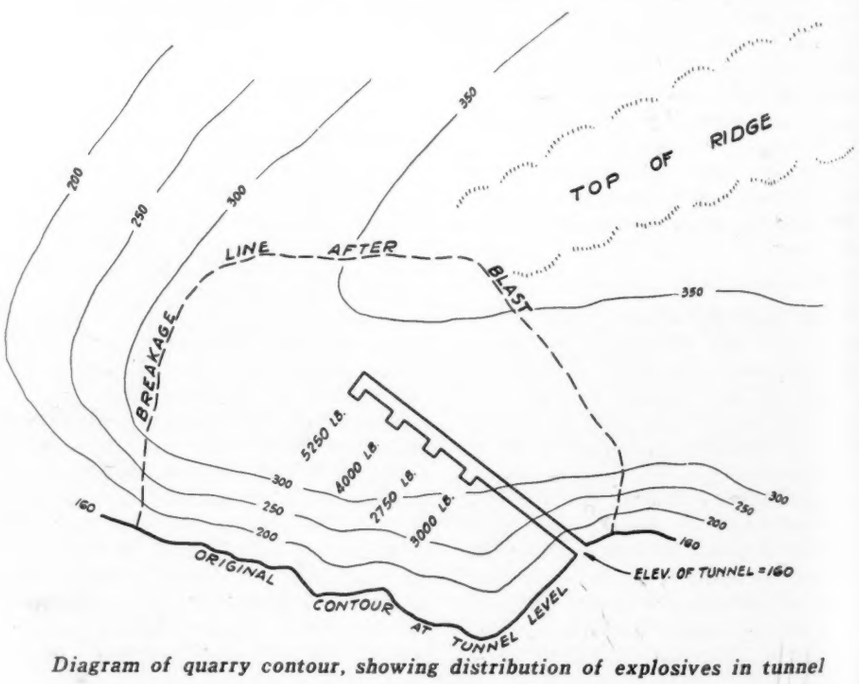


Diagram of quarry contour, showing distribution of explosives in tunnel

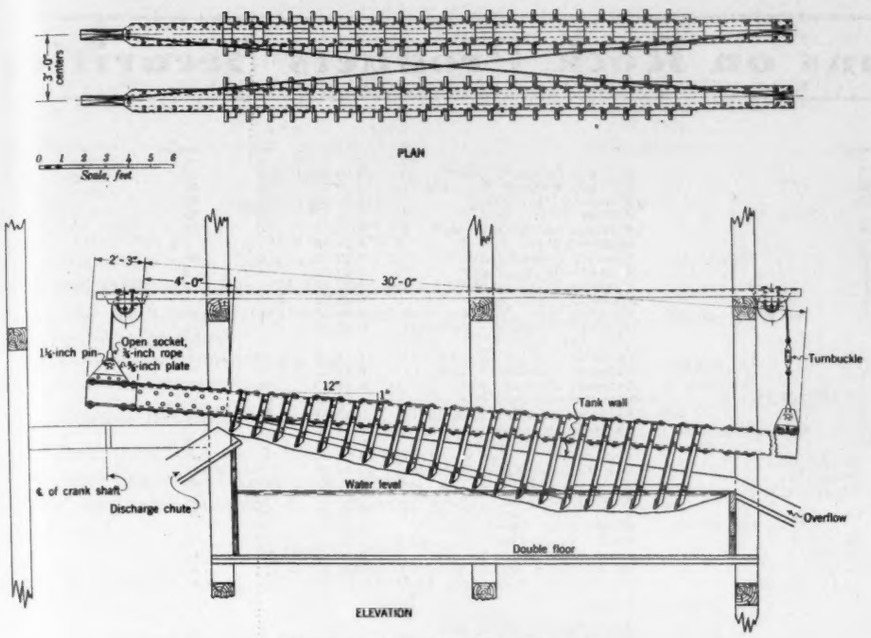
Shop Tools

THE REPAIR SHOP of the sand and gravel plant of the Six Companies, Inc., Junction City, Nev., is well appointed.

Welding plays a very important part in

Repair headquarters

the repair and construction work incidental to this operation. In the illustration can be seen a General Electric welding outfit as



Gravel washer and dewaterer

well as an oxy-acetylene outfit, and in the shed-like structure is housed a small Ingersoll-Rand air compressor for miscellaneous shop uses.

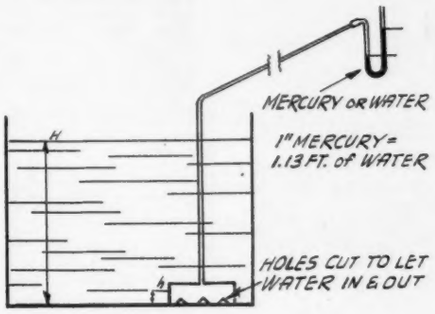
This feature of having ample and modern tools with which to work is everywhere evident on this construction job, and many commercial producers could well bear this in mind when they consider their shrinking profits. If you can judge a carpenter by his tools, why can't you judge an entire operation similarly?

Remote Indicator

A SATISFACTORY remote water level indicator can be made in a few minutes from a mercury column as shown by the accompanying sketch. The bell can be made from a short section of pipe with a notch or two cut in the bottom so that water will flow in and out when it rests on the bottom of the tank. Connecting pipe from the bell to the mercury column can be small piping, rubber tubing or copper tubing, shellacked well at the joints so that there is no leak; a slow leak will cause the instrument to read low.

At least a section of rubber tubing may well be used so that the bell can be pulled out of the water occasionally and filled with air. This will correct for leakage and air absorbed by the water. All that is necessary is to pull it up above the top of the water and lower it again slowly.

About one inch of mercury should be allowed in the column for each foot depth of water. If the tank is shallow a water column instead of a mercury column can be used. As shown in the sketch as the water in the tank rises it flows in the bell and compresses the air so that the water will rise up in the bell also and the pressure that will be read on the instrument is the difference in pressure H-h. For this reason the bell should be made as big and shallow as practical so that the distance h will remain small. If the pan is only 4 in. deep and large enough so that the volume of the pipe is small in proportion, a pressure change which would cause the air volume to be halved would increase only about 2 in. which is negligible. So the depth of water can be calculated from the relation. Inches of mercury times 1.13 equals the depth of water in the tank.



Indicator for water level

Balanced, Reciprocating, Rake Type Gravel Washer

A RATHER UNUSUAL sand and gravel washer and dewaterer is described by Edward B. Kendall, vice-president and operating manager, Pacific Coast Aggregates, Inc., in U. S. Bureau of Mines, I. C. 6705, on "Mining Methods and Costs at Plant C, Eliot, Calif."

The material handled is about 20% retained on 3-in. opening. This material is first fed to a 6x30-ft. revolving scrubber and scalping screen with ⅝-in. and 2¾-in. round openings. The oversize goes to crushers and all material passing the screen goes to a reciprocating washer mounted directly below the scalper. The accompanying drawing shows a plan and elevation of the washer which consists of two balanced rakes inclined at 1 in. to the foot and driven through a crank shaft rigidly connected at the upper end and belted to the countershaft common to both scalper and washer. This shaft is driven by a 60-hp. motor. The washer, 30 ft. long and 6 ft. wide, was designed by the company's engineering department.

Crusher Oil Pump Improvement

By Ross Wheelton
Hamilton, Ontario, Can.

THE OLDER MODELS of a popular make of gyratory rock crusher use a plunger pump for lubrication. This is sometimes troublesome after the rings become worn, and also in cold weather when the oil becomes congealed.

At our plant we overcame these troubles by fitting up a small spur-gear pump. These pumps can be obtained quite cheaply from almost any dealer in used machinery.

The drive was arranged as the accompanying illustrations show. A piece of wood was cut to fill the keyway in the end of the crusher countershaft. The shaft was then taped and given a coat of shellac. This provides ample friction for a pulley to drive the pump.

The shaft for the pump was made from a piece of half-inch water pipe, slipped over the short shaft of the pump and secured by a setscrew. A split pulley was fitted to the other end of the pipe, and a 3-in., 2-ply rubbert belt connecting the two pulleys completed the layout.

Spur gear pump replacement

Recent Quotations on Rock Products Securities

Stock	Date	Bid	Asked	Dividend
Allentown P. C., com.[47]	9-23-33	3	5	
Allentown P. C., pfd.[47]	9-23-33	7	10	
Alpha P. C., com	9-20-33	14½	16	
Alpha P. C., pfd	9-20-33	70	....	50c qu. Sept. 15, '33
Amalgamated Phos. 6's, '36[47]	9-23-33	94	96	
American Aggregates, com.[47]	9-23-33	1	2	
American Aggregates, pfd.[47]	9-23-33	10	15	
American Aggregates 6's w.w.[47]	9-23-33	25	30	
American Aggregates 6's ex-w.[47]	9-23-33	20	28	
Amer. L. & S. 1st 7's[47]	9-23-33	50	55	
Arundel Corp., com.[47]	9-23-33	23	25	50c qu. Oct. 2, '33
Bessemer L. & C. Class A[47]	9-23-33	3	5	
Bessemer L. & C. 1st 6½'s[47]	9-23-33	15	17	
Bessemer L. & C. cert. of dep.[47]	9-23-33	15	17	
Bloomington Limestone 6's[47]	9-23-33	5	8	
Boston S. & G. new com.[37]	8-15-33	1	3	
Boston S. & G. new 7%, pfd.[37]	8-15-33	5	10	1.75 qu. Jan. 3, '33
Boston S. & G. 7's, 1934[19]	8-15-36	40	50	
California Art Tile, A[9]	9-18-33	1½	2	
California Art Tile, B[9]	8-18-33	½	....	
Calaveras Cement, com	9-18-33	2¼	6	
Calaveras Cement 7%, pfd	9-18-33	40	....	1.75 qu. Oct. 15, '33
Canada Cement, com	9-18-33	8 actual sale		
Canada Cement, pfd	9-18-33	34 actual sale		
Canada Cement 5½'s, 1947[46]	9-12-33	76½	77	
Canada Crushed Stone bonds[42]	8-16-26	70	....	
Canada Crushed Stone, com.[42]	8-16-33	3	....	
Certainteed Products, com	9-16-33	4½	5	
Certainteed Products, pfd	9-16-33	20	25	
Certainteed Products 5½'s, 1948[46]	9-19-33	46 actual sale		
Cleveland Quarries	9-20-33	....	24	
Consol. Cement 1st 6½'s, A[47]	9-23-33	10	13	
Consol. Cement, pfd.[47]	9-23-33	1	2	
Consolidated Oka Sand and Gravel (Canada) 6½'s[12]	8-15-33	No market		
Consolidated Oka Sand and Gravel (Canada), pfd.[42]	8-15-33	No market		
Consol. Rock Prod., com.[47]	9-23-33	½	¾	
Consol. Rock Prod., pfd.[47]	9-23-33	1	2	
Consol. Rock Products units[47]	9-23-33	2	3	
Consol. S. & G., pfd. (Can.)[19]	8-15-33	30	35	
Construction Mat., com.[47]	9-23-33	1	2	
Construction Mat., pfd.[47]	9-23-33	2½	3½	
Consumers Rock and Gravel, 1st Mtg. 6's, 1948[47]	9-23-33	20	25	
Coosa P. C. 1st 6's[47]	9-23-33	22	28	
Coplay Cem. Mfg., pfd.[47]	9-23-33	6	8	
Coplay Cem. Mfg. 6's, 1941[47]	9-23-33	35	40	
Dewey P. C., com.[47]	9-23-33	50	75	
Dolese and Shepard	9-17-26	9	10½	
Dufferin Pav. & Cr. Stone, com.	9-19-33	1⅝ actual sale		
Dufferin Pav. & Cr. Stone, pfd.	9-19-33	30 actual sale		
Edison P. C., com.[47]	9-23-33	2	4	
Edison P. C., pfd.[47]	9-23-33	4	6	
Federal P. C. 6½'s, 1941[47]	9-23-33	30	35	
Giant P. C., com.[47]	9-23-33	2	4	
Giant P. C., pfd.[47]	9-23-33	10	15	
Gyp. Lime & Alabastine, Ltd.	9-15-33	4½ actual sale		
Gyp. Lime & Alabastine 5½'s, 1948	9-19-33	47	49	
Hermitage Cement, com.[47]	9-23-33	10	15	
Hermitage Cement, pfd.[47]	9-23-33	40	50	
Ideal Cement 5's, 1943[47]	9-23-33	93	97	
Ideal Cement, com	9-23-33	23	25	25c qu. July 1. '33
Indiana Limestone 6's[47]	9-23-33	15	20	
International Cem. com	9-20-33	32	32¼	
International Cem. bonds, 5's	9-16-33	80 actual sale		Semi-ann. int.
Kelley Island L. & T.	9-21-33	10	12	25c qu. Jan. 2, '33
Ky. Cons. Stone, 6½'s, 1933	9-19-33	5	6	
Ky. Cons. Stone, com.[47]	9-23-33	....	½	
Kentucky Cons. Stone, pfd.	9-23-33	....	10	
Ky. Cons. Stone, 7% pfd.[47]	9-23-33	....	10	
Ky. Cons. Stone 1st Mtg. 6½'s[46]	8-25-33	8	....	
Ky. Cons. St. V. T. C.[47]	9-23-33	No market		
Ky. Rock Asphalt, com	9-19-33	....	2	
Ky. Rock Asphalt, pfd.	9-19-33	1½	....	
Ky. Rock Asphalt 6½'s, 1935	9-19-33	53	55	
Kentucky Stone, com.	8-19-33	....	¼	
Kentucky Stone, pfd.	8-19-33	....	10	
Lawrence P. C.	9-20-33	19½	22½	
Lawrence P. C. 5½'s, 1942[47]	9-23-33	50	60	
Lehigh P. C., com	9-18-33	15⅝	16½	
Lehigh P. C., pfd.	9-18-33	71¾	80	87½c qu. Oct. 1, '33
Louisville Cement[47]	9-23-33	70	80	
Lyman-Richey 1st 6's, 1935[47]	9-23-33	80	85	
Marbelite Corp., com (cement products)	7-15-33	5c	½	
Marbelite Corp., pfd.	7-15-33	⅛	....	
Marquette Cement, com.[47]	9-23-33	7	8	
Marquette Cement, pfd.[47]	9-23-33	50	54	1.50 qu. Jan. 3, '33
Marquette Cem. Mfg. 1st 5's, 1936[47]	9-23-33	65	70	
Marquette Cem. Mfg. 1st 6's, 1936[46]	8-22-33	62 (nominal)		
Material Service Corp.[47]	9-23-33	5	7	
McCrady-Rodgers, com.[47]	9-23-33	7	10	
McCrady-Rodgers 7%, pfd.[47]	9-23-33	35	40	
Medusa P. C., com.[47]	9-23-33	10	15	
Medusa P. C., pfd.[47]	9-23-33	30	35	
Michigan L. & C., com.[47]	9-23-33	50	55	
Missouri P. C.	9-21-33	7½	7¾	
Monarch Cement, com.[47]	9-23-33	50	60	
Monolith P. C., com.[47]	9-23-33	2	3	
Monolith P. C., pfd.[47]	9-23-33	4	5	25c qu. Sept. 28, '33
Monolith P. C., units[47]	9-23-33	5	8	
Monolith P. C. 1st Mtg. 6's[47]	9-23-33	60	65	
Monolith Portland, Midwest[47]	9-23-33	½	1	
National Cem. (Can.) 1st 7's	7- 8-33	80 (nominal)		
National Gypsum A, com.	9-17-33	8	9	
National Gypsum, pfd.	9-17-33	68	71	1.75 qu. Oct. 1, '33
National Gypsum 6's[47]	9-23-33	80	83	
National L. & S. 6½'s, 1941[47]	9-23-33	65	70	
Nazareth Cement, com.[47]	9-23-33	3	5	
Nazareth Cement, pfd.[47]	9-23-33	30	35	
Newaygo P. C. 1st 6½'s[47]	9-23-33	40	45	
New England Lime 6's, 1935[14]	8-16-35	No market		
N. Y. Trap Rock 1st 6's, 1946	9-15-33	62¾	63	
N. Y. Trap Rock 7%, pfd.[47]	9-23-33	65	70	1.75 qu. Jan. 3, '33
North Amer. Cem. 1st 6½'s[47]	9-23-33	20	25	
North Amer. Cem., com.[47]	9-23-33	1	2	
North Amer. Cem. 7%, pfd.[47]	9-23-33	2	3	
North Shore Mat. 1st 6's[47]	9-23-33	35	40	
Northwestern States P. C.[47]	9-23-33	32	35	
Northwestern Port. Cem. Units	9-23-33	30	35	
Ohio River S. & G., com.[47]	9-23-33	1	2	
Ohio River S. & G. 1st, pfd.[47]	9-23-33	5	10	
Ohio River S. & G. 2d, pfd.[47]	9-23-33	2	4	
Ohio River S. & G. 6's[47]	9-22-33	8	15	
Oregon P. C., com.[47]	9-23-33	10	12	
Oregon P. C., pfd.[47]	9-23-33	60	65	
Pacific Coast Aggr., com.[40]	8-18-33	5c	15c	
Pacific Coast Aggr. pfd.[40]	8-18-33	20c	40c	
Pacific Coast Aggr. 6½'s, 1944[8]	8-18-33	20	22	
Pacific Coast Aggr. 7's, 1939[8]	8-18-33	1	3	
Pacific Coast Cement 6's, 1937[47]	9-23-33	45	50	
Pacific P. C., com.	8-17-33	6	10	
Pacific P. C., pfd.	8-17-33	72	....	
Pacific P. C. 6's, 1935[47]	9-23-33	87	90	
Pacific Portland Cement 6½'s, pfd.[5]	8-18-33	32	....	1.62½ qu. Jan. 5, '33
Peerless Cement, com.[47]	9-23-33	¼	¾	
Peerless Cement, pfd.[47]	9-23-33	2	3	
Penn.-Dixie Cement, com	9-20-33	5⅜	5½	
Penn.-Dixie Cement, pfd.	9-20-33	16	19	
Penn.-Dixie Cement 6's, A	9-15-33	67 actual sale		
Penn. Glass Sand Corp., pfd.[47]	9-23-33	65	75	
Penn. Glass Sand Corp. 6's[47]	9-23-33	92	97	
Petosky P. C., com	9-21-33	1¼	2	
Petoskey P. C. 6's, 1941[46]	8-22-33	40 actual sale		
Petoskey P. C. 6s, 1937	9- 5-33	41½	45	
Phosphate Mining Co. (N. Y.) com.[47]	9-23-33	No market		
Port Stockton Cem., com.[9]	8-18-33	No market		
Republic P. C. 6's, 1943	9- 5-33	64	69	
Riverside Cement, A[47]	9-23-33	5	6	
Riverside Cement, B[47]	9-23-33	1	2	
Riverside Cement, pfd.[47]	9-23-33	70	75	1.50 qu. Aug. 1, '33
Rockland and Rockport Lime, 1st, pfd.	9-23-33	1	2	
Sandusky Cement 6's[47]	9-23-33	35	40	
Sandusky Cement 6½'s, 1932-37[47]	9-23-33	40	45	
Santa Cruz P. C., com.[47]	9-23-33	55	60	1.00 qu. July 1, '33
Schumacher Wallboard, com.[47]	9-23-33	1	2	
Schumacher Wallboard, pfd.[47]	9-23-33	3	5	
Signal Mt. P. C., pfd.[47]	9-23-33	10	15	
Southwestern P. C. units[47]	9-23-33	225	250	
Southwestern P. C., com.[47]	9-23-33	40	50	1.00 qu. Jan. 1, '33
Southwestern P. C., pfd.[47]	9-23-33	80	90	2.00 qu. Jan. 1, '33
Standard Paving & Mat. (Canada), com.[47]	9-23-33	2	5	
Standard Paving & Mat., pfd.[47]	9-23-33	40	45	
Superior P. C., A[47]	9-23-33	20	25	27½c mo. May 1, '33
Superior P. C., B[47]	9-23-33	5	7	
Trinity P. C. units[47]	9-23-33	25	30	
Trinity P. C., com.[47]	9-23-33	3	5	
Trinity P. C., pfd.[47]	9-23-33	23	26	
U. S. Gypsum, com	9-20-33	46	48	25c qu. Oct. 2, '33
U. S. Gypsum, pfd.	9-20-33	118⅛	125	1.75 qu. Oct. 2, '33
Wabash P. C.[47]	9-23-33	5	6	
Warner Co., com[47]	9-23-33	3	5	
Warner Co. 1st 7%, pfd.[47]	9-23-33	15	20	
Warner Co. 6's, 1944, w.w.[47]	9-23-33	30	40	
Warner Co. 6's, 1944, ex-w.[47]	9-23-33	25	30	
Whitehall Cem. Mfg., com.[47]	9-23-33	10	12	
Whitehall Cem. Mfg., pfd.[47]	9-23-33	25	30	
Wiscon. L. & C. 1st 6's, '33[47]	9-23-33	70	90	
Wiscon. L. & C. 6½'s[47]	9-23-33	70	90	
Wolverine P. C., com.[47]	9-23-33	2	3	
Yosemite P. C., A, com.[47]	9-23-33	2	5	

Quotations by: [5]Smith, Camp & Riley, San Francisco, Calif. [9]A. E. White Co., San Francisco, Calif. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [14]First Wisconsin Co., Milwaukee, Wis. [19]Hewitt, Ladin & Co., New York, N. Y. [37]Wise, Hobbs & Arnold, Boston. [40]Martin Judge, Jr., and Co., San Francisco, Calif. [42]Nesbitt, Thompson & Co., Toronto. [46]First Union Trust & Savings Bank, Chicago, Ill. [47]Anderson Plotz and Co., Chicago, Ill.

Ideal Cement

INCOME account of the Ideal Cement Co., Denver, Colo., for the year ended December 31, is reported as follows:

	1932	1931
*Net income	(d)$225,460	$ 418,826
Other income	318,888	260,456
Total income	93,428	679,282
Bond interest	207,300	207,300
Balance	(d)113,872	471,982
Dividends paid	687,406	1,260,245
Deficit for year	801,278	788,264

Current assets as of December 31, 1932, were $8,575,477, of which $5,216,752 was cash and marketable securities. Current liabilities were $168,306.

*After depreciation and federal taxes.

Signal Mountain Cement

INCOME account of the Signal Mountain Portland Cement Co., Chattanooga, Tenn., for the year ended December 31, is reported as follows:

	1932	1931
Revenue	$313,703	$894,684
Operating expenses, etc.	376,505	818,591
Depreciation	65,540	134,496
Operating deficit	128,342	58,401

The last common dividend paid was $1.50, March 1, 1927; the last preferred dividend, January 1, 1928.

The balance sheet as of December 31, 1932, showed current assets of $498,542, of which $247,388 was inventories, and current liabilities of $16,422. Total assets and liabilities were written down approximately $400,000 during 1932.

National Gypsum Co.

THE report of the National Gypsum Co., Buffalo, N. Y., for the year ended December 31, 1932, contains the following:

After allowance for federal income taxes, bond interest and reserves for depreciation and depletion, net earnings of the company for the year ended December 31, 1932, were $231,479. This compares with $276,991 for 1931 and is equal to approximately $9 per share on the preferred stock.

During 1932 the cash position of the company was improved by $122,508. At the close of the year net working capital was $1,034,481 compared with $994,260 for 1931.

During the year $180,710 was paid in dividends on preferred stock; $59,269 was spent for plant improvements, retirement of farm mortgage and the purchase of the company's own bonds to the amount of $45,000 face value.

The board of directors decided during the year to reduce the book value of depreciable assets to more conservative values under present conditions. The principal fixed assets on the balance sheet were therefore revalued.

After revaluation of the properties by the auditors total assets were written down $2,382,942 and the results are reflected in the accompanying balance sheet.

The advantage of these adjustments is that each of the property items has a real future value; however, by reducing their valuation to current levels the burden of fixed charges has been reduced and the profits of the company will benefit therefrom.

At a special meeting of stockholders held December 20, the book value of the capital stock was reduced by $800,589 when par values of $5 for Class A and $1 for Class B stock were ratified.

The amount thus taken from capital was transferred to surplus account. After deducting from surplus the write-down in assets there was a balance remaining in surplus account of $313,337.

BALANCE SHEET OF THE NATIONAL GYPSUM CO., AS OF DECEMBER 31, 1932

ASSETS

Current		
Cash and certificates of deposit	$234,334.67	
U. S. Government securities (market value $338,542.44)	327,250.25	
Customers' accounts receivable less reserve for doubtful accounts	356,585.26	
Inventory (at lower of cost or market)	198,806.53	
Total current assets		$1,116,976.71
Gypsum and lime deposits Owned and leased, less depletion to date		1,855,484.56
Other assets		60,562.86
Plant and equipment		1,135,225.20
Patents and Trademarks At cost, less amortization		48,014.56
Deferred charges		67,510.25
		$4,283,774.14

LIABILITIES

Current		
Accounts payable	$ 48,605.49	
Accrued interest, local taxes, etc.	11,390.00	
Federal income tax —estimated	22,500.00	
Total Current liabilities		$ 82,495.49
License Agreement Payable monthly on board sales		88,124.04
6% Sinking Fund Gold Bonds—1943 Outstanding		491,000.00
Capital and Surplus		
Preferred stock—7% Cumulative—Par Value $100; Authorized, less unissued	$2,629,566.67	
Class "A" Common —Par Value $5— Authorized, less unissued and subscriptions	664,250.83	
Class "B" Common —Par Value $1— Authorized and issued	15,000.00	
Capital surplus	313,337.11	3,622,154.61
		$4,283,774.14

Note: The accumulated dividend on preferred stock at December 31, 1932, amounted to $557,783.39.

STATEMENT OF INCOME OF NATIONAL GYPSUM CO. FOR THE YEAR ENDED DECEMBER 31, 1932

	1932	1931
Income from sales, after deducting manufacturing costs, selling and administrative expenses, depreciation, depletion, credit losses, and other reserves	$285,407.07	$310,368.42
Deduct interest on bonds	31,428.49	33,377.59
Net income from operations	$253,978.58	$276,990.83
Deduct provision for federal income tax	22,500.00	none
Net profit for the year	$231,478.58	$276,990.83

Monolith Resumes Dividends

DIRECTORS of the Monolith Portland Cement Co., Los Angeles, Calif., on September 7 declared a dividend of 25 cents a share on the 150,000 shares of 8% cumulative preferred stock, representing a payment on accumulations.

Net earnings of the company for the eight months ended August 31, last, after all charges, amounted to $185,158.35, as compared with a net loss of $102,043.59 for the corresponding period of last year.

The company's balance sheet at August 31, last, showed a current ratio in excess of 6 to 1.

As of July 1, last, the company reported outstanding $893,000 first mortgage bonds of the original issue of $1,000,000, the company having retired $107,000 of bonds. Of the present outstanding bonds, the company holds in its treasury bonds estimated to be sufficient to take care of the next three years' sinking fund requirements, it is stated.

In declaring the current disbursement of $37,500 to preferred stockholders, which is payable September 28, the directors were guided by the improved earnings of the company and also by a desire to cooperate with the President's efforts to reestablish national prosperity, the company's statement says.

Ross Island Sand and Gravel Co.

THE Ross Island Sand and Gravel Co., Portland, Ore., reports balance sheet as of December 31 as follows:

Assets:	1932	1931
Property (less reserve)	$1,486,096	$1,514,618
Special deposits	211	17,420
§Depletion instal., etc.	5,353	1,559
Investments not pledged	5,000	5,000
*Investments (pledged)	1,123,075	1,123,075
Current assets:		
Cash	2,059	1,381
Accounts receivable, net	2,177	8,076
‡Inventories	30,662	31,439
Contract deposit	2,700	2,022
R. H. Schneeloch liability	17,090	17,090
Dividends receivable	5,322	5,322
Deferred debits	59,991	60,791
Total	$2,739,736	$2,787,793
Liabilities:		
7% preferred stock (par $100)	$ 636,170	$ 636,170
†Common stock and surplus	1,459,260	1,511,567
First 7s, 1937	488,100	492,100
Current liabilities:		
Notes and accounts payable	11,023	15,555
Deposits payable	5,352	1,559
Taxes payable	23,344	12,491
Salaries and wages payable	330	445
Accruals	47,980	12,756
Due others	54,110	41,210
Due to affiliated companies	12,856	46,520
Special deposits	211	17,420
Total	$2,739,736	$2,787,793
Current assets	$ 37,598	$42,918
Current liabilities	143,139	84,016
Working capital	(d)105.541	(d)41,098

*Pledged to secure funded debt. †After deducting operating loss, disposal of property, writeoff of organization expenses, etc.: 1932, $52,307; 1931, $60,655. ‡At lower of cost or market. §Depletion installment and value of property released from trust indenture to be deposited with trustee.

Preferred stock dividends accumulated since June 30, 1927, have not been declared or paid. Interest on bonds and sinking fund requirements subsequent to January 1, 1932, have not been paid.

Recent Dividends Announced

Alpha Portland Cement Co., pfd. (qu.)	$ .50	Sept. 15
Arundel Corp. (qu.)	.50	Oct. 2
Calaveras Cement Co., 7% pfd. (qu.)	1.75	Oct. 15
Monolith Portland Cement Co. 8% cum. pfd. (qu.)	.25	Sept. 28
National Gypsum Co. 7% pfd. (qu.)	1.75	Oct. 1

Code Hearings

Cement Industry

THE code of fair competition of the cement industry submitted to the N. R. A. at the hearing in Washington, September 15, is unique among the codes thus far presented in that it is really constructive rather than a recital of things that are taboo. The code proper is brief, containing the usual subjects and placing the execution of the code entirely in the hands of a "Cement Industry Committee" of three members to be elected or appointed by the board of directors of the Cement Institute from its membership and the two or more non-voting members to be appointed by the N. R. A.

Then there is a lengthy supplement to the code, to be a part of it, which describes in detail "trade practices, which for the most part have been long observed by the industry and represent the combined experience and best thought of those who have for many years been engaged in the production, sale and distribution of portland cement." These approved trade practices are then set forth at length, covering (1) standardization of product; (2) terms and conditions of sale; (3) method of selling and marketing; followed by a more elaborate recital of unfair trade practices, and unfair competition.

The code proper explains quite eloquently the present demoralized condition of the industry and suggests specific ways to control production, distribution, and a method for market stabilization. Unlike most of the other codes it contains no provision against selling below cost. The manufacturer "may meet the prices, terms and conditions of sale, established by the method described, as of their effective date, and no manufacturer shall deviate from the prices, terms and conditions of sale, so established, except in the manner described." The method of establishing prices is on the open-price plan, where the manufacturers quote f. o. b. delivery point and stick to their quotations until others are published. Any manufacturer may change his prices upon due notice to the Cement Institute, unless the Cement Industry Committee objects; then the prices shall be held in abeyance until the objections are with drawn. This provision seems fair if it is kept in mind that the N. R. A. has adequate representation on this committee with the manufacturers; for its members would have just as much weight in preventing unwarranted price increases as the three manufacturers' members would in preventing unwarranted price cuts.

More than 100 persons attended the hearing. Deputy Administrator Malcolm Muir opened the procedure, but soon turned the chair over to his assistant, Malcolm Pirnie. The technical adviser of the deputy administrator was Frank H. Smith, a former president of the Portland Cement Association. E. C. Eckel, well-known cement consultant, upheld the interests of the Labor Advisory Board, and the Consumers Advisory Board was represented by E. M. Tisdale.

Charles F. Conn, president of the Cement Institute, presented the code. Mr. Conn outlined the aims and purposes of the Institute, which is not to be confused with the Portland Cement Association, an entirely separate body devoted to sales promotion and technical research activities. He also elaborated upon the financial condition of the industry, stating that in the past 4½ years cement manufacturers had earned an average of only 0.6% per year on total net invested capital.

Labor Provisions Satisfactory

Speaking on Article III, Mr. Conn praised the labor provisions of the Recovery Act and informed the administrator that the cement industry had voluntarily accepted the labor provisions of the code on August 1, with a resultant increase of 55% over 1932 in number of men employed and total wages paid.

John J. Porter, speaking in behalf of the Cement Institute, explained the need for wide latitude in hours of employment because of the necessity for continuous operation. He said that an average 36-hour week would increase the number of men normally employed in the industry by about 42%.

Although the labor provisions of the cement code were more liberal than those in many codes previously submitted, David Kaplan, representing the American Federation of Labor and affiliated unions, demanded a maximum work week of 30 hours, consisting of five 6-hour shifts. He recommended that the provision allowing employes in packing and shipping departments to spread 936 hours of work over a 6-month period be modified to provide time-and-half-time pay for all work in excess of an 8-hour day or a 40-hour week.

Mr. Kaplan presented statistics to show that the work week in the cement industry during four months of 1933 varied from 30.7

Status of the Rock Products Codes

LIME INDUSTRY'S code presented and hearing held August 8—said to have been approved with various changes by the deputy administrator, now awaiting action of the administrator and the President.

AGGREGATE INDUSTRY'S code presented August 28 and 29 and hearing held—conferences in progress—revisions made.

CEMENT INDUSTRY'S code presented and hearings held September 15 and 16.

GYPSUM INDUSTRY'S code in the course of preparation; will be presented before September 30; hearing probably in October.

hours to 34.9 hours. He contended, therefore, that a 36-hour week would not relieve unemployment in the cement industry. These figures failed to check Institute figures.

The A. F. L. proposed a minimum wage of 50 cents an hour with no differential between North and South. In support of this demand, Mr. Kaplan cited economic studies which showed that an average family should have an income of $33 a week to maintain a proper standard of living. Under the provisions of the cement code, this would require two wage earners in each family in the North, and three in the South. He cited other studies in an attempt to show that there is no justification for a wage differential on the basis of lower cost of living in the South. E. C. Eckel of the Labor Advisory Board of N. R. A. later mentioned a 5-cent differential.

Mr. Kaplan concluded his remarks with a recommendation that 18 years be set as a minimum for workers rather than 16, and that a representative of labor should be included on the code authority.

The Federation of Architects, Engineers and Technicians also demanded a 30-hour week, with double pay for overtime which should be limited strictly to emergencies. A specific objection was made to the lack of classification for technical workers, and a recommendation was made to the effect that $65 a week should be the minimum pay for technical men, scaled downward through assistant and junior grades to $30 a week for an apprentice.

Consumer Protection Assured

In a clear-cut presentation, E. M. Tisdale stated that the Consumers Advisory Board of N. R. A. would not approve any code promoting monopolistic practices. Provisions in the cement code for allocation of production and restriction of new plants were not to the best interests of consumers, he said.

Production Control Asked

Article VIII of the proposed code calls for control of production and distribution. R. S. Weaver, president of the Allentown and Valley Forge Cement companies, presented a brief in support of its provisions. S. W. Storey spoke for the Institute in favor of Article VIII.

J. Ross Hanihan of the Volunteer Portland Cement Co. explained the situation in District 6. He stated that only 6.4 per cent of the productive capacity of that district is represented by the two independent mills, the rest of production being in control of so-called chain plants. In protection of minority rights, therefore, he asked that a detailed capacity survey of the industry be inaugurated immediately as a basis for administering Article VIII. He stated that the finer grinding and longer burning of present-day cement has influenced the capacity of existing mills, and that the basing of capacity upon maximum production over a 3-month period is not good practice.

W. J. Young of the Standard Lime and Stone Co. protested against Article VIII, asking that all control of production and distribution be eliminated.

William M. Richardson, president of the newly-organized National Portland Cement Co., stated that his company was building a plant at Brodhead, Penn., but that he had been ignored by the Institute in the preparation of the code. He contended that he was justified in objecting to being legislated out of business before his plant was completed.

The Santa Cruz Portland Cement Co. reiterated the stand of the Volunteer representative for a capacity study. The informal consensus of both the Administration and the Institute seemed to be that a careful survey of the industry should begin immediately.

E. C. Eckel, in behalf of the Labor Advisory Board, objected to any plan of stabilization which would allow plants to consolidate with permanent shutdown of producing units because such procedure was bound to reduce employment. He asked also for both Government and labor representation on the code authority.

Joseph S. Young, president of the Lehigh Portland Cement Co., summarized the contentions of the Institute in relation to Article VIII. He quoted Price-Waterhouse figures to show that the average loss per barrel of cement manufactured in 1931 was 10 cents, and 33 cents in 1932. He felt that safeguards must be set up to protect the industry against the price-cutter, and that production and distribution control is the only way to accomplish these results.

Continuance of Delivered Price Quotations Desired

Charles F. Lewis, of the Volunteer Portland Cement Co., raised the question whether the industry was to continue operations under the assumption that all brands of cement are the same. He felt that cement may vary considerably in quality, and that better cement should command higher prices. Mr. Lewis objected to the mode of operation of Article IX on the grounds that the committee might withhold information about price changes to benefit their companies.

A representative of truck and trailer interests discussed basing-point prices and objected that the system eliminates active competition. He stated that trucks were losing much business because the cement industry retains a system of price control wherein pre-calculated freight rates play an integral part.

A representative of cement importers quoted the prevailing wage rates for longshoremen to bring out the point that this class of labor already makes much more than the cement code provides, and that increased imports of cement would aid purchasing power.

Governor Horner of Illinois Represented

Robert Kingery of the State of Illinois Department of Public Works, speaking in behalf of Governor Horner, accused the Cement Institute of being a tyranny controlled by a powerful minority. As evidence he reviewed the much-publicized cement bids in Illinois where all manufacturers continued to quote identical prices regardless of repeated rejections. During this controversy, the University of Illinois, at Governor Horner's request, conducted cost studies which indicated that the price of cement should have been 28-30 cents lower than the prevailing quotations. He stated further that the use of

Code hearing in Washington, D. C., August 28 for producers of crushed stone, sand, gravel and slag

quotations, f. o. b. plant, would remedy much of the evil, and asked the Administration to insist upon such a provision in the code.

Mr. Kingery also protested specifically against the districts outlined by the Institute, stating that they might be satisfactory for the statistical purposes of the Bureau of Mines but they did not represent logical market areas. New plants should not be prohibited, in his opinion, and detailed cost studies should be made in order to provide an equitable price base.

The Assistant Chief Highway Engineer of Illinois seconded Mr. Kingery's remarks, and added the thought that the cement industry might well be considered a "public utility" because of its absolute necessity in highway construction. He also recommended a capacity study, stating that the industry must have been operating at nearly 100% of capacity in 1928, judging from the difficulty experienced in securing cement to maintain construction schedules.

Basing-Point Prices Supported by Institute

In one of the finest presentations of the day, Joseph S. Young supported the basing-point price system included in the code. With the aid of interesting exhibits, he outlined the situation in the Lehigh district and in Illinois. The producing capacity of the Lehigh district is 48,000,000 bbl. a year, whereas the local market in which the district would enjoy a freight advantage or at least equal freight rates with competitive plants amounts to less than 5,000,000 bbl. a year. The rest of the present marketing territory could be served more economically from other mills north and south of the district. It is questionable, however, whether these mills could meet the increased demands of a price system, f. o. b. plant. Any such scheme would completely demoralize the cement industry of eastern Pennsylvania, throwing thousands of men out of work and causing the loss of about $87,000,000 of invested capital. Furthermore, although the localities near the mills might enjoy lower prices for cement, proportionally higher freight rates elsewhere would result in average prices throughout any district virtually identical to those under the present price system.

In Illinois a similar situation exists. Prices, f. o. b. plant, would limit the market areas of Illinois plants to small areas around LaSalle and Dixon. The rest of Illinois more logically should be served by plants in adjacent states. Locally, certain counties would benefit by lower prices, but, according to Mr. Young, a careful survey of the entire state indicated that the average price would be about the same as a standard delivered price. Furthermore, f. o. b. plant prices would create individual monopolies around each plant in each of which the price could be raised to a level barely under that of outside competing plants.

Of even greater interest to Illinois is the indisputable fact that the Governor's recommendation for prices to be quoted f. o. b. plant would result in about three-fourths of Illinois cement markets being supplied by plants outside the state, certainly an economic loss to the people of Illinois.

Dealers Object to Code

If each dealer who expressed a desire to be heard in connection with Article VI and the supplement had presented testimony, the hearing would have continued indefinitely. Acting Deputy Pirnie, realizing that their interests were virtually identical, recommended that they appoint a dealers' committee to prepare a brief for the administrator. The principal objection of the dealers, of course, was that the code recognized too many exceptions to sales through dealers.

From the opposite point of view, Harry Kirk of the Associated General Contractors of America objected to a continuation of the policy to pay dealers 10 cents a barrel on all cement used on large jobs in their territories. He felt that the dealer should be compensated only when he has actually helped in the consummation of the sale.

Similar statements were made by Einar Christensen in behalf of the cinder units manufacturers and by Benjamin Wilk speaking for the Concrete Masonry Association. Both contended that a large concrete products manufacturer should not pay the dealer in the territory 10 cents a barrel for cement delivered direct to the products plant. Smaller concrete products manufacturers of course would continue to buy through dealers.

Mr. Pirnie suggested that the dealers' committee and a second committee representing contractors and concrete products manufacturers should meet with the Institute and attempt to arrive at a solution of their respective grievances. The administration, of course, will aid negotiations insofar as practicable.

These details may take several weeks, but it is reasonable to expect that the industry will be operating under the code when the large volume of business under the Public Works Administration becomes available.

The provisions for control of production are given in full as follows:

Article VIII—Control of Production and Distribution

1. It is generally agreed by members of the Institute, that it is imperative, in order to effectuate the policy of Title I of the Act, to specifically provide in the Code for (a) control of production; (b) equitable distribution of sales and shipments; and (c) stabilization of the market on a basis that will enable the Industry to pay employees adequate wages sufficient to provide a decent standard of living and yield investors in the Industry a fair and reasonable return on invested capital.

Portland cement is a standardized product and the Industry is operating at a greatly reduced rate, thus accentuating competitive rivalry and it is generally agreed among the manufacturers subject to the provisions of this Code that the total production shall be apportioned among the various plants upon some plan of controlled production, to be determined by the Board of Trustees of The Cement Institute, provided that:

(a) Such plan shall be fair and equitable to all plants;

(b) Such plan shall in no way reduce the total production of all plants below what is necessary to amply supply demand;

(c) In each District the percentage to be shipped by individual companies shall be determined by the companies located in the District;

(d) Failure of any manufacturer to comply with the established plan for controlled production at any time, as may be provided by the said Board of Trusees, shall constitute an act of unfair competition.

2. *Increase in Productive Capacity.* Prior to the establishment of a new cement manufacturing plant, or the increase in the productive capacity of an existing one, or the movement of all or part of such a manufacturing plant from one place to another, The Cement Institute, on receipt of such information, shall promptly collect complete information concerning existing productive capacity in the area in which the proposed new manufacturing facilities are to be located, together with data concerning consumption of cement in that area. If these data disclose that such new manufacturing facilities will result in further increasing the problem of over-production or over-capacity in such area, The Cement Institute may petition the President of the United States to prohibit the construction, or operation, of the proposed new manufacturing plant or the increase in manufacturing capacities of such existing manufacturing plants.

3. *Excess Productive Capacity.* If it shall be brought to the attention of the Board that any area is burdened with a permanent excess of productive capacity over current or prospective demand, a survey of the plants in such area, by competent engineers of its selection, may be directed by said Board to ascertain and report to the Board the relative economic status of the several plants in such area; and when such survey is completed and report thereof made to the Board with copies thereof to the manufacturers concerned, a meeting of all interested parties shall be duly called by the Board to consider ways and means for the elimination of such excessive productive capacity.

4. Subject to the approval of the President, the Board may negotiate an agreement between and among the manufacturers mentioned in section 3 of this article for the closing down or amortization of the less economical plants involved, to the extent necessary to correct the excessive production in the area or areas involved as shown by the survey above mentioned; provided that in the event no agreement as above contemplated shall be consummated, then The Cement Institute may petition the President for such relief in the premises as may be available under the Act.

Mineral Aggregates

A VERY representative gathering of approximately 100 producers attended the code hearing in Washington August 28 and 29 of the crushed stone, sand, gravel and slag industries. A two-day preliminary meeting of the producers was held to attempt to straighten out any differences prior to the formal hearing before the Deputy Administrator Malcolm Muir, of the N. R. A., and his assistants and advisors.

The preliminary hearing served the purpose of giving oppositionists a chance to organize. It also resulted in some rather rad-

ical last minute changes in the proposed code, so that revisions in the official copy already on file with the N. R. A. were necessary. Most of these changes were of an editorial nature to clarify the meaning and purpose of the code in defining organization and administration machinery. The radical changes came in the labor and marketing practices articles of the code.

Because, between the Chicago meeting one month earlier and this Washington meeting, various industries in the South had established wage schedules in their codes as low as 22 cents per hour for Negro labor, the mineral aggregate producers saw no reason why they should pay 30 cents, as the code adopted at Chicago and already filed with the N. R. A. called for. Producers in the five Southern states, Alabama, Florida, Georgia, Mississippi and South Carolina, pleaded successfully—so far as getting their pleas in the final draft was concerned—for a 22 cents per hour scale.

The "Marketing Practices" article was the subject of much informal discussion and many conferences. The final draft read as follows:

Section 1. *Cost Protection.* Whenever and so long as the National Control Committee determines that it will contribute toward accomplishment of the declared purposes of the code, and whenever the National Control Committee working in conjunction with the various District Committees is satisfied that it is able to determine cost of production, as defined in Section 2 of this Article, then the National Control Committee in conjunction with one or more District Committees is authorized to establish in such Districts, and from time to time revise, minimum prices to protect the cost of production of the several products of the industries governed by this code. Such minimum prices shall be established with due regard to the maintenance of free competition between products of the industries governed by this code and with the products of other industries, and to the encouragement of the use of said products of the industries governed by this code.

The current weighted average cost of production of each product of each of the industries governed by this code in a District shall include the various elements of cost as specified in the uniform cost accounting systems as provided for in Section 2 of this Article.

No producer selling products produced by the industries governed by this code in a district in which has been established, as provided herein, a minimum price, shall sell at a less price except to the extent required to absorb the differentials in transportation charges, provided such absorption shall not reduce the net f. o. b. plant price below the prime plant cost as determined under the costing systems provided for in Section 2 of this Article.

Section 2. *Uniform Cost Accounting.* The National Administrative Committee shall, with the approval of the National Recovery Administration, establish uniform accounting and costing systems for the industries governed by this code, which uniform systems shall be consistent with reference to basic elements of cost in the industries involved with such due allowance for individual conditions affecting any producer or group of producers as may be approved by the National Administrative Committee in conjunction with the National Recovery Administration, including in this respect any district so electing, the addition of transportation charges as a cost element, which cost shall also include as an element of cost a reasonable return on capital invested.

Each producer shall adhere to the uniform system adopted for the industry in which he is engaged to the extent of incorporating in all calculations of cost of all of the elements outlined in the standard cost accounting system.

Prime plant cost referred to in Section 1 of this Article shall include all cost elements included in the costing system except return on capital invested, interest on borrowed capital, depreciation, depletion, taxes, administration and selling.

Section 3. *Uniform Terms of Sale.* In each region or district the Regional Committee or District Committee may establish uniform terms of sale uniform within such region or district which shall be binding upon all producers selling in that region or district.

Section 4. *Uniform Credit Practices.* In each region or district the Regional Committee or District Committee may establish credit practices uniform within such region or district which shall be binding upon all producers selling in that region or district.

This article is modeled largely after a similar clause in the code of the lumber industry, which has already been signed by the President.

The article "Plant Capacity and Production" in its final draft read as follows:

Section 1. To promote the fullest possible utilization of the present productive capacity of the industries governed by this code, and to effectuate the other purposes of the National Industrial Recovery Act, before a new plant may be established or the producing capacity of an existing plant increased, or an existing plant removed from one producing site to another, notice of such intent must be given to the Regional Committee of the region in which the new production capacities are proposed to be located. Upon receipt of such notice, the Regional Committee shall collect promptly and with diligence complete information concerning the existing production capacity in that area. If these data disclose that such new production capacity will not tend to defeat the purposes of the National Industrial Recovery Act, as herein set forth, then the Regional Committee shall grant permission within fifteen days after receipt of such notice for the proposed increase in production capacity in that area. If, however, these data disclose that wherever commercial production of the products of the industries governed by this code is economically available in adequate quantity and such proposed increase in production capacity does tend to defeat the purposes of the National Industrial Recovery Act, as herein set forth, then it shall be the duty of the Regional Committee to recommend, within fifteen days after receipt of such notice, to the National Control Committee that permission to increase the production capacity in that area be denied. The decision of the National Control Committee shall be subject to appeal only to the National Recovery Administration.

The provisions of this section shall not be construed as preventing a producer from improving the efficiency of his plant through the installation of new machinery, or adopting such methods as will lower production costs.

There is precedent for this article also in other codes submitted.

The language of both these articles will have to be changed, according to recent advices from Washington, but both the industry and the N. R. A. are fully aware that some scheme of market and production control must be worked out. As the ideas on these subjects are changing from day to day at Washington there is little to guide one in guessing what will be the outcome, but the committee on organization of the industries seems quite positive that a satisfactory solution will come.

Opposition Defined

Opposition to the code as presented comes from four sources: (1) Small operators, or their champions, who objected to the method of choosing the district and regional committee members, a majority *by one* of such committees being elected by weighted voting—votes rated on a 5-year average production basis; (2) portable plant operators who quite naturally objected to the restrictions of their operations proposed; (3) manufacturers of machinery and equipment, particularly portable-plant equipment, who saw in the attempt to control the building of new plants, and the changing of locations of old ones, the serious restriction of their business; (4) labor representatives who made a plea for a 30-hour week and a 50-cent minimum wage, as a matter of principle, apparently, rather than because they expected them.

The opposition to the weighted system of voting was apparently based on the theory that the district or regional organizations were political rather than industrial. Our political theory, of course, is based on democracy, or the equality of voting power of all citizens. Our industrial theory is the same as it is everywhere else in the world, that stockholders should have weighted votes—the number of shares of stock—in deciding issues in connection with their corporation. Corporation history does not disclose any agitation for equal votes on the part of stockholders, regardless of the amount of their stock ownership, or any dissatisfaction with this "undemocratic" method of industry control.

The opposition of portable-plant operators was unquestionably justified, for a literal interpretation of the code and its enforcement would leave them scant opportunity for much of their business. The object designed to be accomplished in regulating competition between established commercial producers and portable plant producers is difficult to define in any code in a few understandable words. The established producer is not blind to the possibilities of the portable plant, as some uninformed critics have charged; he fully recognizes its place in the field. The reason he does not himself operate portable plants is not because he lacks progress or is wedded to his investment in an obsolete established plant, as the same uninformed critics have charged, but because portable-plant production has been such a cut-throat business that there was no inducement to engage in it.

Obviously there is a place for all three types of operation in the mineral aggregate industry: (1) the established plant; (2) the

temporary movable plant; (3) the strictly portable plant. If each can be confined to its right economic sphere of operation, which is all the code of the industry can possibly accomplish, every one would have to be satisfied. No doubt that is the way the N. R. A. will analyze the problem, and along that line it will work out its solution, for such a solution can be found if based on adequate data, which are available.

The opposition of the machinery manufacturers is not serious because eventually they will have to do business with all producers of aggregates; and sellers never have considered it helpful to their business interests to antagonize permanently their customers. The chief objection of the portable plant equipment manufacturers was aimed at provisions in the code which, if accepted, would help control or prevent competition by public authorities; but this kind of competition is just as disastrous to legitimate portable plant operators as it is to established plant operators, so it would seem that there is this one bond of union in the producing end of the industry, at least.

A. J. Blank Still in Mexico

IN the article "Some New Cements—Their Manufacture and Their Special Uses," in ROCK PRODUCTS, August 25, pp. 54-57, the author, Alton J. Blank, was described as consulting chemist, formerly general superintendent, Compania de Cemento Portland "Landa," S. A., Puebla, Mexico. This was an error, for Mr. Blank is still general superintendent of the company.

Prospect for Ballast Business

THE REQUEST of Federal Co-ordinator Eastman that the railroads of the country increase the amount of money spent on deferred maintenance by way of enlarging employment finds the roads more willing than ready to undertake this task, says the *Wall Street Journal* (New York City).

At the moment, most western lines have advanced the rate of their maintenance work, the pick-up having gone into a better stride during July, but task of making earnings sufficient to meet fixed charges is a more immediate concern.

Heads of the leading lines located at Chicago, Ill., uniformly are reserving any public statement as to what they may be able to do for Mr. Eastman and by way of adding impetus to the national recovery program. All of them have programs of maintenance, both probable and on a larger pattern desired, before them. How far they will actually be able to go in increasing the amount of maintenance work is held subject to the trend in traffic later this year. Indications are that none expects to go much beyond necessitous work this summer.

Although carloadings have come back substantially in most instances, exceptions being lines affected by crop damaged, and lower operating costs have boosted net operating incomes, the generally pressing need is that these incomes be applied as fully as possible to fixed charges. Nonetheless, all executives feel keenly the desirability of greater employment and also the value of general rehabilitation of their lines. They may be expected to go as far as they can.

California Mineral Aggregate Men Present State Code

UNDER a new California law designed to supplement the N. I. R. A. state codes of fair competition may be adopted and enforced by industry. The first code presented under the law was by the mineral aggregate industry. The hearing was held August 28 in San Francisco.

The code is sponsored by the Rock, Sand and Gravel Products Association of Northern California and the Rock Products Code Association of Southern California. Together, spokesmen for the groups said, they represent 95% of the production volume in the state and more than 90% of the individual producers.

Garvin Pelsue, president of the Rock Products Code Association of Southern California, conducted the presentation of the code for the sponsors. Mr. Pelsue is sales manager for Graham Brothers, Inc., Long Beach.

Anson S. Blake of Blake Brothers Co., San Francisco, and vice-president of the Northern California association, appeared for local interest in the absence of Charles M. Cadman, president of the association, who was in Washington. Protests against the terms of the code came from two sources.

Organized labor, represented by S. Kagel of the Pacific Coast Labor Bureau, authorized to speak for seven labor unions, declared he would oppose all the labor provisions in the code, excepting the 36-hour week. He objected, he said, to the suggested wages of 40 and 50 cents an hour and to the general classifications proposed for labor into unskilled, semi-skilled and skilled.

The unions for which Mr. Kagel said he spoke were the Brotherhood of Teamsters, Hod Carriers, Steam and Operating Engineers, Marine Engineers, Ferry Boatmen, Master Mates and Pilots, and Shovelmen. His protest resulted in a ruling from the presiding commissioner that the department would recognize a committee of officials from these unions as authorized to speak for labor in formulating the code. Employers sponsoring the code were directed to meet with the labor committee and endeavor to effect an agreement on wage and working conditions acceptable to both sides.

The administrator's ruling was made over the protest of employers that there was little if any union labor employed in their plants at the present time.

The second protest presented that the code was that of the Imperial Rock Corp., Los Angeles, through its attorney. He objected to the administrative feature of the code which proposes limitation of producing units to protect established plants in local territory. It provides for a committee of producers to rule on proposed plant extensions.

This section, the lawyer charged, would operate to prohibit the so-called casual contractor, or owner of portable equipment from competition except as permitted by owners of established plants. Spokesmen for the code sponsors asserted that the portable plants as operated by the casual contractors resulted in destructive competition for established local owners unless their operations were restricted to territory not already served by adequate plants.

Portland Cement Yardage

AWARDS of concrete pavement for July and for the first eight months of 1933 are announced by the Portland Cement Association as follows:

	Sq. yd. awarded during August, 1933	Sq. yd. awarded to date, Sept. 2, 1933
Roads	5,299,905	17,624,489
Streets	345,486	2,184,550
Alleys	4,186	124,194
Total	5,649,577	19,933,233

Feldspar

United States Bureau of Mines has published statistics of the feldspar industry for 1932, which show the total output of crude feldspar, including both potash and lime-soda spars, was 104,715 long tons, 28% less than in 1931 and 50.3% less than in 1928, the year of peak production. The value of crude feldspar produced in 1932 was reported at $539,641, against $861,059 in 1931. Production of ground feldspar also declined sharply. Sales of domestic ground spar by merchant mills dropped from 132,542 short tons in 1931, valued at $1,630,917, to 104,289 tons, valued at $1,174,833 in 1932.

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N. I. R. A. Code of the feldspar grinding industry provides for a 40-hour week, a minimum wage of 35c per hour in the North and 30c in the South.

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Lime

Gibsonburg Lime Products Co., Gibsonburg, Ohio, has been reorganized with W. H. Price, Woodville, Ohio, president; he was formerly with the Ohio Hydrate and Supply Co., and prior to that with the Valve Bag Co. of America. G. H. Faist, Woodville, formerly with the Woodville Lime Products Co., is another member of the new company. F. W. Zorn, former president, is now vice-president; W. L. Watt is secretary; Sanford G. Price, treasurer.

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Washington Building Lime Co., Woodville, Ohio, is the purchaser of the Bruns Hydrated Lime Co., Woodville, the sale of which was noted in ROCK PRODUCTS, August 25, p. 72, according to more recent reports.

Digest of Foreign Literature

By F. O. Anderegg, Ph. D.
Consulting Specialist, Pittsburgh, Pa.

Bituminized Cements. Dr. Walter Dyckerhoff reported to the German Portland Cement Association results of his experiments with a cement to which 4% of bitumen had been added, the addition being accomplished by atomizing the bitumen and mixing with the cement in an air stream. Some such scheme is essential to secure the proper distribution. The addition of the bitumen to one standard portland cement had the effect of increasing the initial set from 3 to 5 hours and the final set similarly. Strange to say, the water requirement was raised from 28 to 35%, probably owing to using up water to form an emulsion. The compressive strength was lowered appreciably but the tensile strength was not much affected. The bitumen lowered the modulus of elasticity, decreasing the brittleness and improving the flexibility.

The setting reactions being greatly retarded, the heat evolution was also slowed down, the maximum temperature being reached in 16 instead of in 10 hours, giving better opportunity for the heat to be dissipated. When specimens were subjected to alternate freezing and heating the compressive strength of the untreated cement was harmfully influenced, while the bituminized cement showed no loss.

The most interesting property is that of volume change. When stored in dry air, specimens made from both cements shrank, but those containing bitumen did so much more slowly than the others. When given alternate wetting and drying, the untreated cement showed the usual saw-tooth behavior, but with the bituminized specimens the contour had been very considerably smoothed out. Similar results have also been obtained by Prof. Graf at Stuttgart, and by Prof. Spannenberg in Munich. Properties such as these are very valuable for road construction.

The German patents are controlled in the United States by the Medusa Portland Cement Co.

Tonindustrie Zeitung (1933) **57,** No. 55, pp. 637-639; No. 57, pp. 660-662.

Addition of Calcium Chloride to Calcareous-Pozzuolanic Cement. Prof. F. Ferrari of the Pisa Engineering School has carried out a series of experiments involving the addition of calcium chloride to some of the pozzuolanic mixtures, which, first developed by the Romans, are still used in Italy. When he added a little more than 1% calcium chloride to mixtures of approximately equal parts of portland cement and pozzuolan, the setting times were slightly accelerated and the water requirement of the neat cement was lowered. The compressive strengths for various ages up to two years were improved, especially for the shorter periods of storage. With a basic chloride ("Cal") a slight improvement in strength was generally found. Ferrari concludes that the addition of calcium chloride to these cements shows considerable promise.

Le Industrie del Cemento (Milan) (1933) **30,** No. 6, pp. 53-55.

Sulfoaluminous Cements. When finely ground, granulated slag is mixed with lime the reaction is very slow and free lime remains present for a long time; but if the slag is mixed with 12 to 15% anhydrite and a small amount of lime or portland cement is added to catalyze the reaction, a very satisfactory product is obtained so far as strength is concerned.

According to S. Klein, the chemistry involved is obscure but the calcium sulfate seems to be almost completely brought into combination and rendered insoluble and free lime seems to be almost completely lacking. As a result this cement shows apparently greater resistance to corrosive waters than any other, even the straight aluminous cements.

Two sorts of accelerated tests seem to give strong indications that this statement is true. If portland or aluminous cement is mixed with calcium sulfate and molded into specimens an expansion which may reach 20% has been observed, while a sulfoaluminous cement does not produce any swelling. The same thing holds when a specimen stored for 8 days is ground, mixed with calcium sulfate and molded into another specimen. The usual tests with lean mixes, have given similar results, but the time required for the tests is much longer.

Klein is very sure that reinforcing bars imbedded in concrete made from this cement would be free from rust, in view of the insolubility of the calcium sulfate and because of the reducing nature of the slag. This cement is being used very successfully in France in sulfate regions.

Revue de Materiaux de Construction et de Travaux Publics (1933) No. 285, pp. 193-197.

Plastic Concrete and Fluid Concrete. A report of a five-year investigation of concrete stored in moist air, in soft water and in sea water, is given by R. Feret. Working with a standard portland, a high early strength portland, a blast furnace and an aluminous cement, he made his first mix quite plastic, with 5 gal. of water per bag; his second, quite fluid with about 7 gal. per sack; and for his third mix by adding fine sand passing through a 65-mesh sieve to the second to bring it back to the consistency of the first. This required the addition of one-third the original weight of aggregate. The cement contents of the three mixes were, in bags per cubic yard, 7.0, 6.5 and 5.3 respectively.

The results obtained with the last two mixes were almost identical, with the third averaging slightly higher than the second. But both of these were about 0.55 as strong as the first mix, whether in compressive or in flexural strength. Feret's conclusion was to add as little fine sand as may be required to give the necessary plasticity and just sufficient water to be able to place the concrete properly.

Science et Industries ed. *Construction et Travaux Publics* (1933) No. 5.

Study of Cement Setting. Jules Cartiaux molded a cylinder of 100 g. of portland cement gaged with 26% water, and placed it quickly on the pan of a balance so that he could observe any changes in weight. For the first ten minutes the rate of loss was 10 mg. per minute and gradually slowing down to 3 mg. per minute at the end of three hours, at which time the rate of loss jumped suddenly to 20 mg. a minute. Again it kept decreasing until eight hours when another sudden break occurred, jumping from 2 to 60 mg. per minute. That is, at two periods, just before the initial and just after the final set, something was happening After this, the rate of loss of water fell off until after 80 days no further decrease occurred. On the other hand, an increase in weight was observed after 90 days, which totaled 1.13 g. by the end of the second year, caused by absorption of carbon dioxide.

Revue de Materiaux de Construction et de Travaux Publics (1933) No. 285, pp. 198-199.

Patent Abstracts

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Commissioner of Patents, Washington, D. C., for each patent desired.

Process for Purifying Silica Sand. For making fused quartz vessels silica sand is usually purified by heating hydrochloric acid, which is expensive because it attacks the treatment vessels in addition to the cost of the reagents. The inventor claims that he can purify the sand sufficiently by adding a very small quantity of citric acid to the quartz before putting it into the electric furnace in which the quartz is to be fused. He claims that there will be no black spots or black threads in the body of the ware, although there may be a few black specks on the surface.—*Otto C. Trautmann, U. S. Patent No.* 1,840,338.

TRAFFIC and TRANSPORTATION

Proposed Rate Changes

THE FOLLOWING are the latest proposed changes in freight rates up to and including the week ending September 16:

Trunk Line

31312. **Limestone, agricultural, dust, ground, precipitated or pulverized,** C.L., min. wt. 50,000 lb., from Jordanville, N. Y., to N. Y. C. R. R. stations and West Shore Railroad stations. Rates ranging from $1.15 to $2.70 per net ton.

31328. To cancel rates on **lime and ground limestone** from points of origin on W. M. Ry. to all destinations covered by W. Md. Ry. I. C. C. 8108 and W. S. Curlett's I. C. C. A-306, to extent indicated below:

Lime—Bricklyn, Pa., Hanover, Pa., Union Bridge, Md., Security, Md., Marl, Md., Pinesburg, Md., Charlton, Md.

Limestone, ground—Bricklyn, Pa., Hanover, Pa., Union Bridge, Md., Pinola, Pa., Cavetown, Md., Pinesburg, Md., Charlton, Md., Frederick (P. E. Co.), Md., Spahrs (P. E. Co.), Md.

Reason: Investigation develops no traffic has moved for some time nor is there prospects for future shipments, therefore rates are obsolete.

31332. **Limestone, crude, fluxing, foundry or furnace,** C.L., minimum weight when loaded in container cars 110,000 lb.; when loaded in open top equipment (See Note 2), from Thomasville, Pa., to Erie, Pa., $2.10 per gross ton. (Present rate, $2.39 per gross ton.) Reason: Proposed rate is comparable with rates on like commodities for like distances, services and conditions.

31386. **Sand, blast, core, engine, fire, glass, grinding, moulding, quartz, silex or silica,** except as shown in (2). (2) **Sand, other than glass,** in open top equipment (See Note 2), from Mill Creek and Ridgway, Pa., to Erie, Pa. (1) $1.35 per net ton, and (2) $1.30 per net ton. Reason: Proposed rates are fairly comparable with rates from Daguscahonda, Pa.

31388. **Crushed stone, and stone screenings,** C. L. (See Note 2), from Jamesville and Rock Cut, N. Y., to Oneida Castle, N. Y., 90c per net ton, not subject to emergency charge. (Present rate $1 per net ton.)

31399. (A) **Lime, building,** C. L., minimum weight 30,000 lb. (B) **Agricultural, chemical and land lime,** C. L., minimum weight 30,000 lb., from Fishers Hill, Linville, Toms Brook, Woodstock and Zirkle, Va., to Coatesville, Pa. (A) $2.50 and (B) $2.30 per net ton. Reason: Proposed rates are fairly comparable with rates from Strasburg and Strasburg Jct., Va., to Coatesville, Va.

M-3251. Cancel present commodity rate of 10c per 100 lb. on **agricultural lime,** C. L., from Jersey Shore, Pa., to Elmira, N. Y. Classification basis to apply.

31403. **Slate** (coal mine refuse), carloads, in open top equipment, minimum weight capacity of car, from Van Voorhis, Pa., to Courtney, Pa., $27.50 per car not subject to emergency charge.

31411. To cancel commodity rates on **crushed stone and stone screenings,** C. L., from Rumbaugh, Pa., to various destinations as shown in P. R. R. Tariff I. C. C. 244. Classification basis to apply.

31341. **Stone, natural** (other than bituminous asphalt rock), **crushed, coated with oil, tar or asphaltum,** C. L. The weight of the oil, tar and/or asphaltum not to exceed 10% by weight of the commodity as shipped, the shipper to so certify on shipping orders and bills of lading. (See Note 2), from Utica, N. Y., to Childwood, N. Y., *$1 per net ton. (Present rate, $1.20 per net ton.) *To apply only on traffic destined beyond to points on the Grasse River R. R.

31348. To adjust the present rates on **sand, stone and gravel, and coated stone,** C. L., from the Port of Norfolk to P. R. R. points as now shown in P. R. R. Tariff V. C. C. 16 as follows:

PAGE 27

(A) Sand, other than blast, engine, foundry, glass, moulding or silica, carloads.

(B) Sand, blast, engine, foundry, glass, moulding or silica, carloads.

(C) Gravel, crushed, carloads.

(D) Stone, crushed, carloads.

(See Note 2.)

(A) Proposed rates from Port Norfolk, Norfolk, Norfolk Yard and Portsmouth, Va., to Cape Charles and Bay View, Va., 80; Cheriton, Cobbs, Eastville, Machiponga, Birds Nest, Nassawadox, Exmore, Belle Haven, Va., 90; Painter, Keller, Onley, Tasley, Green Bush, Parksley, 010; Bloxom, Mears, Hallwood, Makamie Park, Lecate, New Church, Va., 110; Capeville, Kiptopeke, Va., 90c per 2,000 lb.

(B) Proposed from Port Norfolk, Norfolk, Norfolk Yard and Portsmouth, Va., to Cape Charles, Bay View, Cheriton, Cobbs, Eastville, Machiponga, Birds Nest, Nassawadox, Exmore, Belle Haven, Painter, Keller, Onley, Tasley, Green Bush, Parksley, Bloxom, Mears, Hallwood, Makemie Park, Lecate, New Church, Capeville, Kiptopeke, cancel present rates. Class rates to apply.

(C) Proposed from Port Norfolk, Norfolk, Norfolk Yard and Portsmouth, Va., to Cape Charles, Bay View, Cheriton, Cobbs, Eastville, Machiponga, Birds Nest, Nassawadox, Exmore, Belle Haven, Painter, Keller, Onley, Tasley, Green Bush, Parksley, Bloxom, Mears, Hallwood, Makemie Park, Lecate, New Church, Capeville, Kiptopeke, cancel present rates. Rates proposed on gravel on page 33 to apply.

(D) Proposed from Port Norfolk, Norfolk, Norfolk Yard and Portsmouth, Va., to Cape Charles and Bay View, Va., 80; Cheriton, Cobbs, Eastville, Machiponga, Birds Nest, Nassawadox, Exmore, Belle Haven, Va., 90; Painter, Keller, Onley, Tasley, Green Bush, Parksley, Va., 100; Bloxom, Mears, Hallwood, Makemie Park, Lecate, New Church, Va., 110; Capeville, Kiptopeke, Va., 90c per 2,000 lb.

SUP. 10, PAGE 3

(A) Gravel, carloads.

(B) Stone, crushed, C. L.

Minimum weight 50,000 lb.

(A) Proposed from Port Norfolk, Norfolk, Norfolk Yard and Portsmouth, Va., to Tasley, Eastville, Keller, Exmore, Onley, Melfa, Painter, Belle Haven, Maplewood, Nassawadox, Birds Nest, Machiponga, Kendall Grove, Simpkins, Cobbs, Cheriton, Bay View, Cape Charles, Va., cancel present rates. Rates proposed on gravel on page 33 to apply. Rates in cents per net ton.

(B) Proposed from Port Norfolk, Norfolk, Norfolk Yard and Portsmouth, Va., to Tasley, Eastville, Keller, Exmore, Onley, Melfa, Painter, Belle Haven, Maplewood, Nassawadox, Birds Nest, Machiponga, Kendall Grove, Simpkins, Cobbs, Cheriton, Bay View, Cape Charles, Va., cancel present rates. Rates proposed on crushed stone on page 27 to apply. Rates in cents per net ton.

PAGE 33

(A) Sand, not otherwise indexed by name in Official Classification V. C. C. O. C. No. 1 (D. T. Lawrence, agent), supplements thereto or successive issues thereof, carloads.

(B) Sand, moulding, in packages or in bulk, carloads.

(C) Gravel, carloads.

(D) Stone, rubble or crushed, in straight or mixed carloads.

(A) and (B) Proposed, from Port Norfolk, Norfolk, Norfolk Yard and Portsmouth, Va., to Cape Charles, Bay View, Cheriton, Cobbs, Eastville, Machiponga, Birds Nest, Nassawadox, Exmore, Belle Haven, Painter, Keller, Onley, Tasley, Green Bush, Parksley, Va., cancel present rates. Class rates to apply.

(C) Proposed from Port Norfolk, Norfolk, Norfolk Yard and Portsmouth, Va., to Cape Charles and Bay View, Va., 80; Cheriton, Cobbs, Eastville, Machiponga, Birds Nest, Nassawadox, Exmore and Belle Haven, Va., 90; Painter, Keller, Onley, Tasley, Green Bush and Parksley, Va., 100.

(D) Proposed, from Port Norfolk, Norfolk, Norfolk Yard and Portsmouth, Va., to Cape Charles. Bay View, Cheriton, Cobbs, Eastville, Machiponga. Birds Nest, Nassawadox, Exmore, Belle Haven, Painter, Keller, Onley, Tasley, Green Bush, Parksley, Va., cancel present rates on crushed stone. Rates proposed on crushed stone on page 27 to apply.

(C) Proposed, from Port Norfolk, Norfolk, Norfolk Yard and Portsmouth, Va., to Bloxem, Mears, Hallwood, Makemie Park, Lecate and New Church, Va., 110; Capeville and Kiptopeke, Va., 90. Rates in cents per 2,000 lb.

(D) Proposed, from Port Norfolk, Norfolk, Norfolk Yard and Portsmouth, Va., to Bloxem, Mears, Hallwod, Makemie Park, Lecate, New Church, Capeville, Kiptopeke, Va., present rates on rubble stone to remain in effect.

PAGE 14

Gravel, concrete, C. L., minimum weight 50,000 lb., from Port Norfolk, Va., to Cape Charles, Va., Proposed, cancel present rate. Rate shown on page 33 on gravel to apply.

PAGE 19

(A) Stone, crushed, coated with oil, tar or asphaltum, carloads; the oil, tar or asphaltum not to exceed 10% of the commodity as shipped, the shipper to so certify on shipping orders and bills of lading. (B) Stone, crushed, other than coated with oil, tar or asphaltum, carloads. From Port Norfolk, Va., to Tasley and Eastville, Va., (A) present, cancel present rates. Class rates to apply; (B) proposed, cancel present rates. Rates proposed on crushed stone on page 27 to apply.

31355. **Sand, blast, engine, foundry, moulding, glass, silica, quartz or silex,** carload (See Note 2), from Mapleton District, Pa., and Tatesville, Pa., to Carlisle, Pa., $1.80 per net ton.

31124, Sup. 4. (A) **Building lime,** C. L., minimum weight 30,000 lb.; (B) **agricultural land, chemical, gas and glass lime,** C. L., minimum weight 30,000 lb., also **ground limestone,** C. L., minimum weight 50,000 lb., from Thomasville, York, Bittinger, Pa., and Reading Company, Lebanon Valley and Chester Valley, producing points to Hillsdale, N. Y. (A) 22½c and (B) 22c per 100 lb.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

Central

36880. To establish on **barytes, black ash of** (barium sulphide ash), C. L., minimum weight 40,000 lb., from Collinsville, Ill., to Newark, N. J., rate of 36½c.

36884. To establish on **crushed stone,** C. L., from Keeport, Ind., to South Bend, Ind., rate of 85c per N. T. via Wab. Ry., Logansport, Ind., P. R.

36916. To establish on **gypsum,** ground, C. L., minimum weight 80,000 lb.

FROM GRAND RAPIDS, MICH.

To	Proposed	Present
Battle Creek, Mich.	10	11½
Kalamazoo, Mich.	9	10
Niles, Mich.	11	12½
Vicksburg, Mich.	9½	11
Watervliet, Mich.	10½	12

FROM GYPSUM PT., CLINTON, OHIO

To	Proposed	Present
Battle Creek, Mich.	13	15
Kalamazoo, Mich.	13½	15½
Niles, Mich.	14	16
Vicksburg, Mich.	13½	15½
Watervliet, Mich.	14½	16½

36917. To cancel commodity rates on **limestone,** agricultural, C. L., from Kenova, W. Va., to destinations in the state of Ohio, published in Item 2030, C. & O. Ry. Tariff 2252B, Items 1130, 1140 and 1150, and Items 1190 to 1390, inclusive, N. & W. Ry. Tariff 48A, account obsolete, class rates to apply in lieu thereof.

36918. To cancel commodity rates on **limestone dust,** C. L., from Kenova, W. Va., to destinations in the state of Ohio, published in Item 350B, Supplement 37, and Item 670 in C. & O. Ry. Tariff 227J, Items 970, 980 and 990 in C. & O. Ry. Tariff 2252B, and Items 1650 to 1790, inclusive, N. & W. Ry. Tariff 48A, account obsolete, class rates to apply in lieu thereof.

36889. To establish on **sand and gravel,** straight or mixed carload, when cars are loaded to their full cubical capacity and will not contain the above minimum, the actual weight will be applied, but in no case less than 60,000 lb., from Stanford, Ont., to Black Rock, Buffalo and Suspension Bridge, N. Y., rate of §75c per net ton. Present, to Black Rock, Buffalo, N. Y., 88c and to Suspension Bridge, N. Y., 76c per net ton. (When for delivery on connecting lines.)

§Exclusive of switching charges at origin point.

37093. To establish on **crude talc,** C. L., minimum weight 80,000 lb., from Ishpeming, Mich., to Detroit, Mich., rate of 375c per N. T. Present—800c per N. T. (Class C rate).

37099. To establish on **crushed stone** and **agricultural limestone,** in open top cars, C. L., from McVittys, O. (Rates in cents per N. T.)

To	*Proposed	Present
Stillwater, O.	135	380
Strasburg, O.	125	135
Aultman, O.	125	135
Dover, O.	125	135
Canal Fulton, O.	115	135
Louisville, O.	125	125
Gnadenhutten, O.	125	125
Apple Creek, O.	115	125
Beloit, O.	135	380

*Proposed rates are gross rates. Emergency charge not to be applied.

37123. To establish on **sand,** viz., blast,

core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, moulding or silica, in open top cars, C. L., from Dundee, O., to Uhrichsville, O., rate of 80c per net ton.

37124. To establish on **sand**, blast, core, engine, fire, foundry, glass, moulding, quartz, silex or silica, in straight or mixed carloads, from Althom, Pa., to Pittsburgh and Wilmerding, Pa., rate of 180c per net ton.

37125. To establish on **sand and gravel**, in open top cars, C. L., from Portsmouth, O., to Pedro, O., rate of 60c per N. T. via N. & W. Ry., Ironton, Ohio, D. T. & I. R. R. Present, 85c per N. T.

37134. To cancel rate of $2.34 per N. T. on **crushed stone, slag** and/or **gravel**, coated with oil, tar or asphaltum, C. L., from Kenton, O., to Charleston, W. Va., in connection with the B. & O. R. R., published in Erie R. R. Co., Tariff I. C. C. A7191.

36966. To establish on **limestone**, ground or pulverized, limestone screenings, loaded in box cars, C. L., minimum weight 60,000 lb., from Bedford, Mitchell and Putnamville, Ind., to destinations in C. F. A. except to states of Illinois and Indiana, rates based on 60% of sixth class rate.

Southwestern

1753. **Sand and gravel**, from O'Connor, Okla., to Oklahoma points. To establish the following rates in cents per ton of 2,000 lb., not subject to emergency charge, on sand and gravel, C.L. (See Note 3), from O'Connor, Okla., to points shown below:

Manchester	86
Gibbon	90
Wakita	90
Clyde	94
Medford	94
Numa	98
Deer Creek	98
Nardin	102

The proposed rates are 80% of the present rates not including emergency charge and the emergency charge added to the proposed rates, which is the basis used in establishing road material rates to and from other Oklahoma stations.

1754. **Sand and gravel**, from O'Connor, Okla., to points in Oklahoma and Texas. To establish the following rates in cents per ton of 2,000 lb. (not subject to emergency charge), on sand and gravel, C.L. (See Note 3), from O'Connor, Okla., to points shown below:

	Rates
Navina, Okla.	122
Cashion, Okla.	118
Canton, Okla.	94
Longdale, Okla.	90
Fairview, Okla.	86
Yale, Okla.	130
Crescent, Okla.	106
Mobeetie, Tex.	118
Canadian, Tex.	90
Perryton, Tex.	98
Clear Creek, Tex.	86
Glazier, Tex.	86

The proposed rates are based on 80% of the scale in S. W. L. Tariff 162-F and plussed 6c per net ton.

1755. **Crushed stone**, from Moline, Kan., to points in Oklahoma and Texas. To establish the following rates in cents per ton of 2,000 lb., on crushed stone (broken stone, ranging in size up to 200 lb. weight), including ground limestone, in bulk or in bags, but not including gypsum rock or asphalt rock, carloads (See note 3), from Moline, Kan., to points shown below:

	Rates
Alston, Okla.	134
Moorland, Okla.	126
Curtis, Okla.	122
Quinlan, Okla.	122
Belva, Okla.	118
Mobeetie, Tex.	150
Canadian, Tex.	150
Perryton, Tex.	158
Clear Creek, Tex.	144
Glazier, Tex.	144

Rates proposed are 80% of the scale published in S. W. L. Tariff No. 162-F, plussed 6c per ton, wihch basis has been used to establish rates to and from other points in this territory to meet truck competition.

A-1143. **Silica or tripoli**, between points in Southwestern and Kansas-Missouri territories and Eastern points. To amend S. W. L. Tariff 152-B to provide Class 16 rating on silica or tripoli, crushed or ground, C.L., minimum weight 60,000 lb., between Southwestern and Kansas-Missouri territories and Eastern territory as shown in aforementioned tariff.

1752. **Crushed stone**, from Moline, Kan., to points in Oklahoma. To establish the following rates in cents per ton of 2,000 lb., not subject to emergency charge, on crushed stone, as described in Items 10-B and 15, S. W. L. Tariff 162-F, from Moline, Kan., to points shown below:

To	Rates
Sharon, Okla.	142
Love, Okla.	142
Rosston, Okla.	150
Gate, Okla.	150
Knowles, Okla.	158
Hooker, Okla.	158
Optima, Okla.	168
Guymon, Okla.	168

Rates proposed are 80% of the scale in S. W. L. Tariff 162-F, plussed 6c per ton, which is the basis used in establishing rates from and to other stations in the territory.

Southern

2665. **Phosphate rock, crude**, ground or pulverized, not acidulated nor ammoniated, C.L., between points in S. F. A. territory. It is proposed to cancel from Note 94 (Section 1) of Exceptions No. 10 to southern Classification, Agent Dulaney's I. C. C. No. 45, Items Nos. 71, 72, 73 and 75, covering phosphate rock, crude, ground or pulverized, not acidulated nor ammoniated, thereby eliminating the present non-application of class rates and permitting twelfth class rates to apply in the absence of specific commodity rates.

2666. **Sand and gravel**, in straight or mixed carloads; **slag**, C. L., from (a) between A. C. L. R. R. stations in Florida; (b) from A. C. L. R. R. stations in Florida to A. C. L. R. R. stations in Alabama, Florida and South Carolina. It is proposed to cancel, on the obsolete theory, the present rates on the above named commodities from and to the points in question published in Sup. 6 to A. C. L. R. R. Second Division Interstate Tariff No. 12, I. C. C. B-2619, combination rates to apply after cancellation.

2688. **Stone**, viz., limestone or marble, ground or pulverized, C. L., from Cartersville, Tate and Whitestone, Ga., to Roseville, O. Present rate, combination. Proposed rate on stone, viz., limestone or marble, ground or pulverized to fineness to pass through a screen of 200 mesh to the inch, in bulk, or in bulk in bags or barrels, C. L., minimum weight 60,000 lb., from and to above named points, 439c per net ton (subject to emergency charge). This submittal merely suggests restoration of the old rate.

2689. **Barytes**, crude, lump, or jigged, C. L., from Cartersville, Ga., to St. Helena, Md. Present rate, 490c per ton of 2,240 lb. Proposed rate on barytes, crude, lump, or jigged, minimum weight 10% less than marked capacity of car, C. L., from Cartersville, Ga., to St. Helena, Md., 440c per ton of 2,240 lb. (subject to emergency charge).

2743. **Stone**, ground or powdered, C. L., Pounding Mill, Va., to interstate railroad stations. It is proposed to establish a line of commodity rates on stone, ground or powdered, C. L. (See Note 1), from Pounding Mill, Va., to interstate railroad stations $1.47 per net ton, except to Pardee, Derby, Osaka, Andover, Roda and Stonega, Va., to which points rate will be $1.58 per net ton.

2751. **Slate**, crushed, ground or pulverized, C. L., stone chips or granules, other than granite, jasper, marble or onyx (roofing granules), C. L., and **brick**, broken, crushed or ground, C. L., T. L. A. and N. E. F. A. territories to Southern points. At present 15% of first class applies. It is proposed to establish rates on the above named commodity from and to the points in question made on basis of 12% of first class (not subject to minimum rates).

2752. **Barytes**, crude, lump or jigged, C. L., Danley and Donelson, Tenn., to Newark, N. J. At present, class and combination rates apply. It is proposed to establish rates on barytes, crude, lump or jigged, C. L. (See Note 2), from and to above named points, 600c per ton of 2,240 lb. (subject to emergency charge). (Reduction.)

Western

Sup. 2 to 6146-P. Minimum weight, **sand** (blast, engine, filter, foundry, glass, moulding or silica), C.L., between points in W. T. L. territory on traffic on which commodity rates are provided in committee and individual lines' tariffs. Minimum weight, present, determined by size of car used. Proposed, when a carrier cannot furnish car of the capacity or dimensions ordered by shipper, after six full days' notice therefor has been given by the shipper, and for its own convenience furnishes car of greater capacity than the one ordered by shipper, it will be of greater capacity than the one ordered by shipper, it will be used on the basis of the minimum carload weight fixed in tariff or classification to apply on size of car ordered by shipper provided the shipment could have been loaded upon or in a car of the size ordered, but in no case less than the actual weight.

Sup. 1 to 2898-K. **Stone**, crushed, C.L. (See Note 3), but not less than 40,000 lb. from Dell Rapids, S. D., to destinations in Iowa and Minnesota. Rates, present, on varying scales. Proposed (rates in cents per ton of 2,000 lb.).

Distance	Single Line
40 miles and under	75
50 miles and over 40	80
60 miles and over 50	85
65 miles and over 60	91
70 miles and over 65	94
75 miles and over 70	97
80 miles and over 75	100
85 miles and over 80	104
90 miles and over 85	106
95 miles and over 90	109
100 miles and over 95	113
105 miles and over 100	115
110 miles and over 105	117
115 miles and over 110	119
120 miles and over 115	122
125 miles and over 120	124
130 miles and over 125	126
135 miles and over 130	128
140 miles and over 135	131
145 miles and over 140	133
150 miles and over 145	135
155 miles and over 150	137
160 miles and over 155	140

Sup. 2 to 4781-N. **Asphalt rock**, C. L., minimum weight 80,000 lb. per car, except when for carriers' convenience car of less capacity is furnished, in which event marked capacity of car, but not less than actual weight will govern, from Iantha, Lamar and Liberal, Mo., to stations in Minnesota. Rates: Present—Combination rates usually. Proposed—Following arbitrary scale above rate to St. Paul and Minneapolis:

50 miles and under..... 25c per net ton
100 miles and under..... 50c per net ton
150 miles and under..... 75c per net ton
200 miles and under.....100c per net ton
300 miles and under.....125c per net ton
400 miles and under.....150c per net ton

8209-1. Rates: **Stone**, crushed, ground or pulverized, C. L. (See Note 2), but not less than 40,000 lb., from Hannibal, Mo., to Nebraska points. Rates—To representative points.

C. B. & Q. stations—	Miles	(per ton)
Alliance	713.9	*3.70
Ord.	514.5	*2.90
C. & N. W. stations—		
Norfolk	†448.6	*2.80
West Point	†404.3	*2.70
Un. Pac. stations—		
Gering	‡734.3	*4.00
No. Platte	‡572.6	*3.30

†Via C. B. & Q. to Omaha 334.3 miles and C. & N. W. beyond.

‡Via C. B. & Q. to Kearney 477.6 miles and Un. Pac. beyond.

*Rate suggested using Nebraska single line stone scale.

1266-D. Minimum weight: **Stone**, broken or crushed, as described in Item 8520 of W. T. L. Tariff 111-H, from Colorado common points to Missouri River (Group 7). Rates: Present—$5.10 per ton. Proposed—No change. Minimum weight: Present—90% of marked capacity of car except that when actual weight of shipment loaded to full visible capacity of car is less than 90% of marked capacity of car, the actual weight will be the minimum weight. In no case shall the minimum weight be less than 40,000 lb. Proposed—40,000 lb.

4781-O. Rates: **Stone**, crushed, coated with oil, tar or asphaltum, C. L. (See Note 3). From Kansas City, Mo., to stations on the C. B. & Q. R. R. in Missouri. Rates: Present, class rates. Proposed, distance rates published in Item 195, C. B. & Q. G. F. O. 6208-N, P. S. C. Mo. 928. (By shipper.)

3217-1. Rates: **Sand** and **gravel**, C. L., usual minimum weight, from Barry, Ill.:

Wabash Ry.	Miles via Wab.	(Wabash L-10128) Pres.	Pro.
Rensselaer, Mo.	31.5	95c	68c
Huntington, Mo.	34.5	95c	68c
Hassard, Mo.	37.9	95c	68c
Monroe City, Mo.	41.7	95c	74c
Clapper, Mo.	50	95c	74c
Stoutsville, Mo.	53.6	95c	80c
Goss, Mo.	58.9	95c	80c
Paris, Mo.	63.3	95c	85c
Holliday, Mo.	71.1	95c	90c
Madison, Mo.	75.9	95c	90c

3350-F. Minimum weight, **sand, gravel** and **crushed stone**, etc., C. L., as covered by commodity description in I. C. C. Dockets 17000, part 11 and part 11-A, between points in W. T. L. territory. Minimum weight, present (See Note 2). Proposed (See Note 3);

when carrier cannot furnish car of capacity ordered by shipper and for its own convenience furnishes car of greater capacity than the one ordered, car so furnished will be used on basis of the minimum carload weight specified as applicable on car of size ordered provided the shipper does not load in the car furnished in excess of what could have been loaded in the car ordered. In no case will orders be accepted for cars of less than 60,000 lb. marked capacity.

7283-2. Rates: **Sand,** other than silica, bank, blast, glass, engine, fire or furnace, filtering, foundry, moulding, grinding or polishing, or loam sand, also gravel, C. L. (See Note 3), from Pacific, Jedburg and Yeatman, Mo., to Belleville and Scott Field, Ill. Rates: Present—Combination over E. St. Louis, Ill. Proposed—$1.10 per ton of 2,000 lb.

Illinois

7100 (Sub. 28). **Sand and gravel,** C. L., from Bloomington, Ill., to various points in Illinois: Proposal to establish the following rates:

To (rep. pts.)	Rates per net ton
Chicago, Ill.	75
Mazonia, Ill.	73
Nevada, Ill.	76
Varna, Ill.	88
Lacon, Ill.	101
Chenoa, Ill.	63
Lexington, Ill.	50
Towanda, Ill.	40
Griggs, Ill.	70
Danville, Ill.	74
Loda, Ill.	100
Rantoul, Ill.	83
Peoria, Ill.	72
East St. Louis, Ill.	107
Drake, Ill.	119
Boyle, Ill.	113

7449. **Crushed stone,** C. L. (See Note 3), but in no case less than 60,000 lb., to Beardstown, Ill. Rates in cents per net ton.

From	Present	Proposed
Thornton, Ill.	126	114
Lehigh, Ill.	113	101

7452. **Shale,** C. L. (See Note 2), from Anna, Ill., to Joliet, Ill. Present, class; proposed, $2 per net ton.

7489. **Agricultural limestone,** C. L. (See Note 2), from Valmeyer to C. & E. I. Ry. stations, viz.: Salem, Cartter, Kell, Texico, Bakerville, Bonnie, Ina, Whittington, Ill. Rates per ton. Present—$1.19. Proposed—$1.05.

New Sand-Gravel Rates

ERASING a state line so far as sand and gravel rates are concerned, the Interstate Commerce Commission has effected a new deal for shippers in Beloit, Wis., and South Beloit, Ill.

The Chicago and Northwestern Railway and the Milwaukee Line have been ordered to reduce rates on crushed stone, strippings, sand and gravel from South Beloit, Ill., to Milwaukee, Wis., and nearby points to a parity with rates from Beloit, Wis., to the same destinations. The minimum rate fixed by the Commission is 60c a net ton. High rates to intermediate points must be maintained.

I. C. C. Decisions

13425. Cement. Fourth section. By division 3. Relief from the long-and-short-haul provision in rates on cement from points in Maryland, New Jersey, New York, Pennsylvania, Virginia, and West Virginia to destinations in trunk-line territory and points adjacent thereto, and in the 60% group of central territory, authorized in 174 I.C.C. 224, modified to include cement mixture in mixed carloads with cement.

25320. Cement. Oklahoma Portland Cement Co. vs. Chicago, Rock Island and Gulf Railway et al. By division 4. Complaint dismissed. Carload cement rate from Ada, Okla., to Shamrock, Texas, found not unreasonable.

25342. Bituminous Rock Asphalt. Ray L. Harris vs. Illinois Central Railroad Co. et al. By division 4. Complaint dismissed. Rate on bituminous rock, carloads, from Rockport, Ky., to New Era, Ind., found not unreasonable or otherwise unlawful.

3742. Lime. By division 5. Proposed rates on lime, in carloads, from, to, and between points in the Southwest found not justified. Suspended schedules ordered canceled, without prejudice to the filing of rates on the reasonable bases found.

Cement

Ohio Limestone and Portland Cement Co. has been incorporated by Detroit, Mich., and Ironton, Ohio, interests. It is said the corporation has acquired options or leases of 1400 acres of limestone and clay bearing property near Stuce, Ohio. The initial capital of $150,000, it is reported, will be used to develop a limestone quarry and build a crushing plant for producing commercial limestone. Later it is proposed to build a cement mill.

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Huron Portland Cement Co., Detroit, Mich., after many delays and considerable local publicity extending over a year's period, has let contract for the construction of a packing plant at Oswego, N. Y., on Lake Ontario, to the Burrell Engineering and Contracting Co., Chicago, Ill. The cost is estimated at $175,000.

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Santa Cruz Portland Cement Co. and **Pacific Portland Cement Co,** San Francisco, Calif., are engaged in a lively controversy over the cement to be used for the piers of the Golden Gate bridge. The board of directors of the bridge company, according to an article in the *San Francisco Chronicle,* adopted a resolution recommending use of a high silica type of cement, on the advice of Chief Engineer Joseph B. Strauss and consulting engineers O. H. Ammann, Leon S. Moisseiff and Charles Derleth, Jr.

This cement, manufactured by the Santa Cruz Portland Cement Co., was ordered substituted for a Pacific Portland Cement Co. product, heretofore used.

Protesting against the change of materials, Charles A. Ruggles, attorney for the Pacific Portland Cement Co., made these charges before the board: That the high silica cement does not measure up to the standard of the Pacific Portland Cement Co. product, and that it is submitted at the same price, although actually inferior and cheaper to manufacture. That if high silica cement is used the Golden Gate span may collapse, and the contractors have suggested they be relieved of liability in case of a substitute being forced upon them. He made other charges of a more personal nature. The change in specifications were based on the recommendations of the bridge engineers after a careful study and after tests covering a period of more than two years. The silica type cement has been used by the Government of the United States, in the construction of the San Francisco War Memorial, by Pacific Gas and Electric Co., in State highway construction, by Southern Pacific Co., and on many other public and private works. It is expected that it will prove more durable in sea-water concrete.

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Statistics of the portland cement industry for August, compiled by the U. S. Bureau of Mines, show: Produced 8,223,000 bbl., shipped 5,994,000 bbl., in stock at the end of the month 22,077,000 bbl. Production showed an increase of 5% and shipments a decrease of 45.4%, as compared with August, 1932. Portland cement stocks at mills were 13.8% higher than a year ago.

In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 164 plants at the close of August, 1933, and of 165 plants at the close of August, 1932.

RATIO (PER CENT) OF PRODUCTION TO CAPACITY

	August 1932	July 1933	June 1933	May 1933
The month	34.2	35.9	37.6	35.2	27.4
The 12 months ended	32.1	26.5	26.3	26.0	26.0

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Santa Cruz Portland Cement Co., Davenport, Calif., has begun an expansion program which includes warehouses or packing plants at San Francisco, Stockton and Oakland, a 3,000-ft. wharf and loading equipment at Davenport and the purchase and rebuilding as a bulk carrier of the steamer "Pacific Cedar."

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Mississippi state highway department has made arrangements with the U. S. Bureau of Public Roads so as to take advantage of the state's contract for 1,000,000 bbl. of cement made in June. The bids ranged from $2.34 to $2.72 per bbl. delivered. The cement companies have agreed to sell the contractors at the same prices. The price had increased 25c per bbl. since the June bidding. The new arrangement is termed the "Missouri plan," since that state was the first to work out a program on cement contracts acceptable to the federal bureau. Contractors will place orders with any companies listed in the blanket contract and may purchase up to the individual allotment given each concern. The companies and the allotments follow: Universal Atlas Cement Co., Birmingham, 25,000 bbl.; Arkansas Portland Cement Company, Little Rock, 25,000 bbl.; Alpha Portland Cement Co., Birmingham, 225,000; Pennsylvania Dixie Cement Co., Chattanooga, 225,000; Lehigh Portland Cement Co., Birmingham, 100,000; National Cement Co., Birmingham, 75,000; Signal Mountain Portland Cement Co., Chattanooga, 25,000; Marquette Cement Co., Chicago, 75,000; Hermitage Portland Cement Co., Nashville, 175,000; Missouri Portland Cement Co., St. Louis, 25,000.

Rock Products News Briefs

Sand and Gravel

Ohio River producers, are either unusually active or are replacing barges destroyed in recent floods. The American Bridge Co. reports contract for five new 350-ton steel barges for the McCrady Rogers Co.; the Ingalls Iron Works two 161-ton steel barges for the Southern Sand and Gravel Co.; McClintic-Marshall Corp., six 540-ton steel barges for the Union Sand and Gravel Co.

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Bowman Sand & Gravel Co., Gadsden, Ala., has made application to the United States engineer office at Montgomery to dredge sand and gravel from the channel and bars of the Coosa River in Georgia and Alabama between Gadsden and Cedar Bluff.

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Prairie Sand & Gravel Co., Prairie du Chien, Wis., is fighting municipal competition by inserting the following advertisement in the local newspaper:

EXPLAINS COST OF CRUSHED ROCK PRODUCED BY THE CITY

The Prairie Sand & Gravel Co. is a local company, employing local labor at good wages. Selling stone for road and street building is our business—it's the way we make our living, and because we don't believe the taxpayer realizes just what is going on, we have prepared this article.

The mayor and council have opened the stone quarry. The mayor claims he is producing the stone at $0.40 per cu. yd. If this is true then the Prairie Sand & Gravel Co. has no excuse to exist. If the mayor or anyone else can produce local stone for $0.40 a cu. yd., then the manager of the Prairie Sand & Gravel Co. ought to apologize, and go into some other business.

But, by investigating the costs we find the mayor's claim of $0.40 per cu. yd. is hard to understand. The following figures on costs (gathered from the city hall and from other sources from the time the quarry started this season up to August 1st) show that the city produced approximately 1,528 cu. yd. of stone at a cost of $1,984.41. This does not include the free help from tramps, who have been compelled to work in the quarry for three meals a day, said meals costing the city $0.65 per day, or the free labor furnished by the county. The local men working on the quarry get 20 cents per hour, and all the tramps get is 65 cents per day in meals. Do you believe that this is President Roosevelt's idea of helping the forgotten man?

It cost the city $1,984.41 to produce approximately 1,528 cu. yd. of stone, which is about $1.30 per cu. yd., local men working for 20 cents per hour. And bear in mind that this does not include the so-called free labor furnished by the county, or the tramps that work for their meals. And, Mr. Taxpayer, with tramps working for 65 cents per day (in food) and the county paying part of the labor, the cost of producing stone at the quarry is about $1.30 per cu. yd. instead of 40 cents as the mayor claims. This means that for every cubic yard of stone sold to the town of Prairie du Chien and to the Prairie du Chien Bridge Co. the taxpayers of Prairie du Chien pay 90 cents. We see no reason for the taxpayers of the city of Prairie du Chien being compelled to pay 90 cents per cu. yd. toward the building of the roads for the town of Prairie du Chien and keeping up the Prairie du Chien bridge.

From the time the quarry started operation this year up to the first of August, the city has produced approximately 1,528 cu. yd. of stone which if sold for 40 cents per cu. yd. would net the city $611.20. The city records show it cost $1,989.41 to produce this stone, leaving a deficit of $1,378.21 for the taxpayers to pay besides our proportion of the county outdoor relief which furnishes to the mayor a good share of his labor free of charge to the city and not shown in this figure of $1,989.41, but nevertheless, coming directly out of the taxpayer's pocket.

It is not our desire to criticize our present civic administration but we are merely defending ourselves against the mayor's report.

It is very true we have many men out of work and we must make every effort possible to give them employment, but, is it necessary for the city of Prairie du Chien to employ them in this manner? We have several places in the city where we could give them employment whereby the city could get the full benefit of their labor. If the city has this amount of extra money to donate to anyone, let's give it to the working man who needs it, and will leave it with our local merchants, not to the purchasers of our stone.

We are strong believers that this country will not come back to normal until the laboring man is put to work and at a reasonable wage. We only wish we were able to employ one hundred men and if so, we certainly would pay them good wages as usual.

Our company wishes it thoroughly understood that we stand ready and are trying to do all we can to help President Roosevelt in his effort to remedy present conditions.

(Signed) C. J. KNIGHT,
Manager and President,
Prairie Sand and Gravel Co.

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Pioneer Sand and Gravel Co., Seattle, Wash., has moved into its new general offices at 901 Fairview avenue, North Seattle, in a new modern building especially built for it. George W. Gauntlett has been elected president of the company. For the last 14 years he has been with the Grays Harbor Construction Co., recently manager and secretary. The new board of directors of the company includes the addition of C. W. Wiley. F. V. Donnelly and B. F. Morris have resigned. An executive committee consists of Mrs. H. F. Ostrander, P. E. Harris, C. W. Wiley, S. L. Barnes and Lambert Dunbar, chairman.

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Shenandoah Sand and Gravel Corp., Professional Building, Staunton, Va., is erecting a screening and washing plant of 75,000 tons annual capacity. J. B. Murphy is president.

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Smoot Sand and Gravel Corp.'s (Washington, D. C.) president, L. E. Smoot, was the successful (and only) bidder for the southern 9-story office building, 15th and H streets, Washington, at a recent auction. Mr. Smoot's bid was $25,000. There is a prior deed of trust of $1,455,000, interest and taxes, making the purchase price more than $1,480,000. Its present valuation is $2,217,000.

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Buckeye Sand and Gravel Co., Bellaire, Ohio, started a year ago to fill a contract for the Blaine viaduct and highway of about 30,000 tons, announces through its general manager, H. R. Neal, that since the plant is modern and has complete dredging facilities to secure materials from the Ohio river, the firm intends to enter into the general field on sand and gravel throughout the district.

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Milwaukee, Wis., city board of purchases, acting upon recommendations of C. A. Wiepking, director of the testing laboratories, has adopted a revised code, effective on existing contracts, to assure receipt of the proper materials and in quantities ordered. Hereafter all sand, gravel and crushed stone must be weighed instead of being sent to jobs in trucks marked for specific loads. "There will be no more 'watered stock'," Joseph W. Nicholson, city purchasing agent, said. "The laboratories report that when the materials are sprinkled with water to keep dust down, the load swells and the city does not receive what it pays for. We expect to equip inspectors with weighing machines and give them authority to stop trucks to determine actual weight." The new rules require all bidders to furnish bonds guaranteeing satisfactory materials and prompt delivery. No firms will be allowed to enter more than one bid on any material. In the past it was discovered some firms entered several bids under different names, thus gaining an advantage over their competitors.

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Wisconsin sand, gravel and crushed stone producers are already operating under their state and N. I. R. A. codes. Julius P. Heil and August Gawin, N. R. A. enforcement commissioners, met with sand and gravel men of Waukesha, Ozaukee and Milwaukee counties at the federal building, September 11, in an effort to bring them together in a code of fair competition. Of the 45 employers invited to the conference, 44 attended and pledged their co-operation with the N. R. A. They agreed to establish a list price for their products and committees were named for that purpose. Their members are George Brew, Waukesha, and Mrs. M. O. Gillen, Waukesha, for the sand and gravel industry; John and William Manegold, Wauwatosa, and D. H. Francey, Wauwatosa, crushed stone, and Otto Lutz, Milwaukee, Henry Jaeger, Milwaukee, and L. W. Sanders, Milwaukee, for the Milwaukee Aggregate Association. Another conference will be held with the commissioners after committees finish work.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

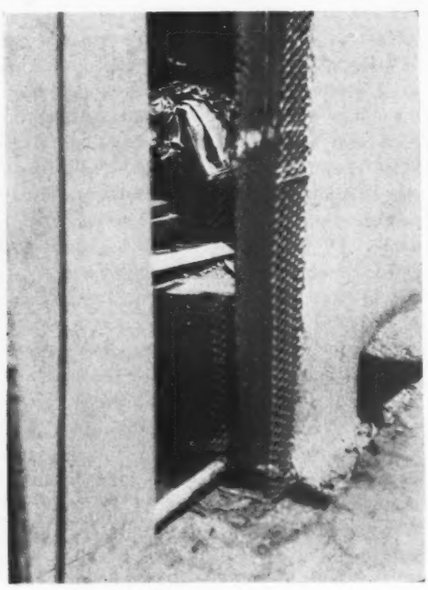
New System of Small House Concrete Construction

New Opportunity for Cement Products Manufacturers and Cement and Aggregate Producers

By Edmund Shaw,
Contributing Editor, Rock Products

THE construction industry in Los Angeles is interested and even a little excited over the announcement that the Garrett system of constructing residences and the smaller business buildings is now available for use. A constant stream of visitors, contractors, architects, engineers and intending builders, has visited Mr. Garrett's place, at 1304 Carmen Drive, Glendale, ever since a brief description was published in a local paper. And since the method may provide an increased market for cement and fine aggregate, the writer investigated it for ROCK PRODUCTS.

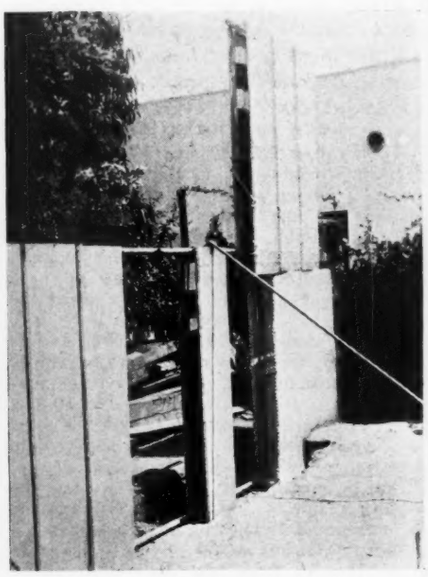
The interest to builders is not so much because it makes a fire and vermin proof building which will withstand every strength test required by the Unified Building Code, but because it can readily compete with frame or stucco on frame construction, which is so much used in southern California for residences and garages, in point of price. This is possible partially because there are no poured foundations and no steel frames or other built-up supports for the walls. The walls, which are of plastered portland cement mortar on steel wire mesh, connected by light sheet metal web members, support themselves and carry the floors and roofs and their loads. By utilizing the strength of the plastered layers and simplifying the methods of construction the cost has been reduced without sacrificing any necessary strength or durability.



Dropped mortar from plastering is smoothed over to make footing for the double wall

Placing the steel forms. Note the square spreader in hand

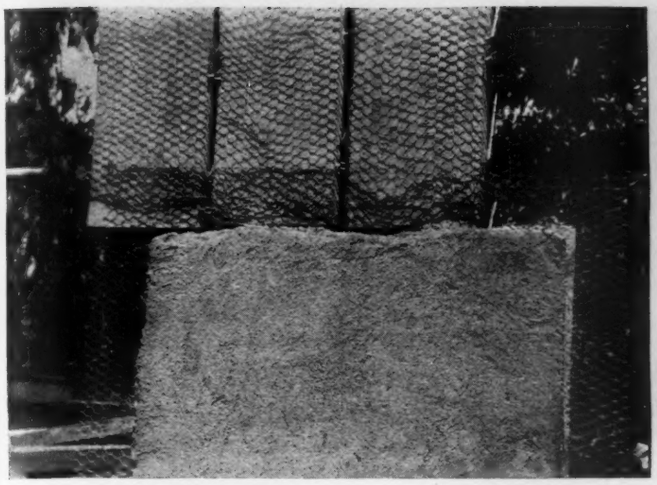
In starting the walls a trench 10 in. deep and 24 in. wide is dug. Pipes, 1½ in. dia. are set up to hold the forms temporarily.

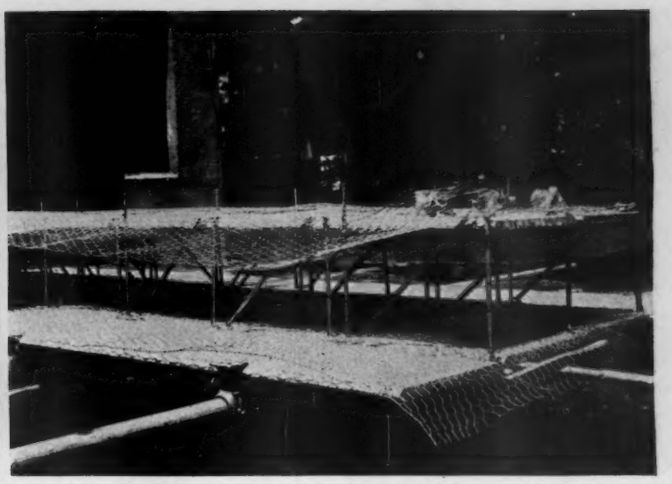


Wall connecting members show on edge of upper wall

The pipes are held together by clamps, where they cross, so they may be taken down easily and used on other parts of the same job as well as on other jobs. The forms are light sheet-metal panels that may be used on a great many jobs. They are set up in pairs, one for the outside wall and one for the inside wall, and are held apart by square spreaders, one of which is shown in the accompanying illustration.

The edges of the forms are shaped to form a V-section. The web members go in the cracks between the forms. These are of half-round sheet metal, light but strong, with fingers on the ends that bend over the wire mesh on which the portland cement mortar is spread. The bent fingers may be seen between the forms in the accompanying illustration, and the web members show on the right-hand end of the upper wall. The





Left: Note fingers of wall connectors between the forms; connectors show in full at right of this picture. Right: Close-up view of Garrett floor construction

V-shaped opening between the forms also shows, and it is plain that when this is filled with mortar the ends of the web members are firmly embedded in it.

The web members hold the wire mesh on the forms, but a more important reason for using them is that they form a light but rigid lattice work that keeps the structure from buckling under load, taking the place of the permanent steel frame used in some other method of construction. Two men can place forms and wire mesh as fast as one man can plaster.

The floors are made just as the walls are made, and are erected (laid) before the walls are put up. Examples of floor construction are shown in the accompanying illustrations. The rods that stick up above the floor in these pictures are to hold the upper panels and are removed as the forms are moved ahead. The floors are built into the walls in such a way that walls carry floor loads.

The floor may be covered with hardwood, tile or any other flooring or it may be finished as a cement floor, in the regular way.

Roof construction is like floor construction, except that web members of varying lengths have to be used between the roof and the ceiling, if the roof is slanted.

The mortar is a 1 to 4 mix of portland cement and sand. The wire mesh is of No. 18 wire with 1-in. openings. Long-time tests have shown that such a wall cannot be saturated by rain, if the plastering is properly done. Exterior and interior finishes may be anything desired. Stuccoing is the easiest, as the wall surfaces are a perfect base for stucco, but exteriors may also be covered with brick veneer or painted with oil paint. A garage was built by this system about 18 months ago for the purpose of testing the strength of this construction. The city of Glendale code calls for 20 lbs. per sq. ft. loading on roofs and 40 lbs. per sq. ft. on floors. The roof was loaded to 80 lbs. per sq. ft. with no measurable deflection, and there was no measurable deflection in the 15-ft. span over the door. After standing on the roof and trying to spring it up and down, I think it would stand a considerably greater load. The building stood the earthquake without cracking and while there have been a few curing cracks from the first, the building, including the uncoated roof, has always been watertight.

The writer was attracted to this system by the intelligent use of materials that it shows. It comes as near to giving maximum strength for minimum weight as any system of which he knows.

Good Construction Can Eliminate Earthquake Hazards

UNNECESSARY, *Engineering News-Record* terms the destruction caused by the earthquake at Long Beach, Calif. Every one interested in the promotion of concrete can use that journal's editorial arguments to good advantage. Today, it states, it is no longer necessary that earthquakes should wreck cities and kill large numbers of their inhabitants. Such destruction merely reflects human neglect to apply what is known of earthquake resistance. Building practice is able to give protection, and in the interests of public safety should be required to do so. How soon the inhabitants of earthquake regions obtain protection depends upon their own initiative. Knowledge of proper building is sufficiently developed to give a high degree of public security, but in the face of increase in cost it will not find general application until the public insists upon it. With full recognition of the present resources of construction and consistent action to utilize them, the hazards of earthquakes can be largely eliminated.

Concrete Products

CANADIAN DEVELOPMENTS are described in a recent bulletin of the Canadian Bureau of Statistics:

"Considerable interest has been recently taken in the utilization of cement in the manufacture of centrifugally spun reinforced-concrete sewer pipe. These are made in machined metal moulds which are poured while revolving on spinning machines. It is stated that the concrete is sufficiently hard immediately after spinning to resist any ordinary pressures; other advantages claimed are that the pipes are impervious to moisture and unaffected by extreme climatic changes, and have a proportionally greater resistance to acids and soil alkalies. The interior of this type of pipe approaches a glazed surface in smoothness.

"More recent developments in concrete construction reveal the increasing consumption of light weight aggregate. This type of material includes such trade products as "haydite," "cell concrete" and "aerocrete." These cellular concrete products are produced either mechanically or by the chemical aeration of the mix. The recent development of the mixed-in-transit system of concrete service is proving, for certain types of construction, to possess very distinct advantages over the older system of mixing on the job.

"A new Canadian-designed machine for producing multiple concrete conduits is now on the market. This is capable of manufacturing conduits for high tension cables in 8-duct, 6-duct, 4-duct, 3-duct, and 2-duct sections in three-foot lengths and for low tension telephone cables in 6-duct, 4-duct, 3-duct and 2-dust sections also in 3-foot conduit lengths.

"It is noteworthy that cement enamel was selected as an interior finish for the North American Assurance Building recently completed in Toronto; cement enamel is a surface application of portland cement combined with various chemicals, with or without the addition of color which, when it hardens, produces a vitreous enamel-like finish that is reported to be practically indestructible, securely bonded, sanitary, washable and non-fading. By proper combination of texture and coloring a wide range of effect is easily attainable."

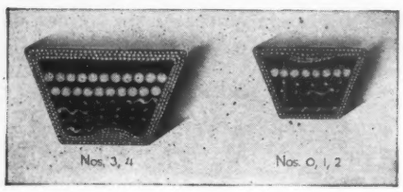
New Machinery and Equipment

Multi-V-Drive

A NEW type of V-belt is announced by Worthington Pump and Machinery Corp., in connection with its Multi-V-drive. High power capacity, long flexing life, uniform cross-section and low stretch are the primary factors considered in designing the new belt. A basic feature claimed is a greater concentration, about the neutral axis of the belt, of the load-carrying capacity. The illustration shows the two variations of the new construction. Nos. 0, 1 and 2 sizes have one endless cord in one plane, and Nos. 3 and 4 sizes have two endless cords in two planes. All cords are completely embedded in rubber, thus affording full insulation for the control of internal heat.

The tension and compression sections of this Goodyear belt are composed of rubber, with layers of fabric distributed through the compression section to prevent excessive flexibility.

The belt is molded to shape, and is completely enclosed in a fabric envelope which



New V-belt in cross section

protects the working elements and provides contact surface for the V-grooved sheave. The fabric for the envelope is so cut that the threads run on the "bias." This prevents the envelope from taking any part of the load, say the designers, thus protecting it from rupture. The envelope is "flipped" on the belt (not spiraled) and is so placed that the edges overlap on the top or bottom of the belt (not on the sides).

Sound Signaling

SOUND signals are in common use for outdoor signalling throughout industry. The bell and whistle have been accepted for generations. More recently, the siren has been developed. Because of its penetrating sound qualities, it has gained rapid acceptance as an emergency signal. The common use of sirens has brought about a growing demand for sound control, both through regulation of the sound signal itself, and through regulation of the direction of the signal to affect only a specified area over which the sound signals should be heard.

In consideration of these demands, E. D. Bullard Co. engineers have developed a dual sound control applying to the sirens. A coding mechanism has been developed which gives a quick, sharp signal. This coding mechanism operates by means of a shutter,

Code siren

which opens and closes the ports and intake area on the stator through which the sound travels. When the shutter is open, the sound comes out in full volume. When the shutter is closed, approximately 95% of the sound is held back.

Caterpillar Diesel Tractor

THE new light weight convertible full Diesel shovel introduced by the Speeder Machinery Corp. is reported as the first light weight full Diesel shovel to be built in the United States. It is rated at five-eighths yd. capacity for shovel, crane, dragline or pull-shovel work. Crane and dragline booms are 35 ft. in length, the shovel boom is 18 ft. long and the dipper stick 14 ft. in length. As a shovel it is equipped with either a standard bucket for bank or subgrade work or manganese bucket for rock work. Model D4 is powered with a "Caterpillar" Diesel motor and weighs only 15 tons.

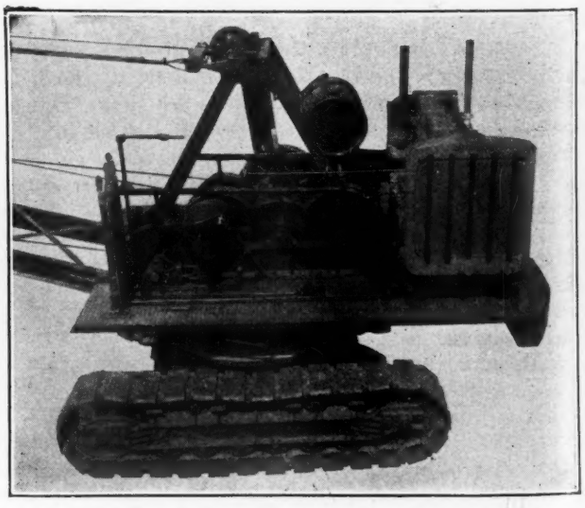
Only nine spur gears are used in the machine and every working part is said to be accessible without dismantling. Shafting has been increased in diameter, gear faces have been increased, a Morse lubricated silent chain five inches in width and only 34 in. in length from center to center transmits the power from the motor to the mechanism. The travel gears are heat treated and run in an oil bath.

All shafts are dead end, no shafts revolve in the drums, thus allowing both shaft and drum to stop the minute their specific function is performed, says the company. The economy of this feature is obvious. The illustration shows the Speeder D4 with cab removed.

Portable Power for Pump

REPLACING steam power, a portable 30 kw. electric generating set is said to be saving an Illinois brick company $20 a day in pumping clay pits. As the plants of this concern have been shut down temporarily, pumping the pits dry would necessitate starting up boilers at a cost of from $50 to $60 a day. With a portable Westinghouse 30 kw. generator unit it costs only about $30 a day, requiring the minimum amount of attention.

The generator is driven by a Hercules gasoline engine requiring about 100 gal. of gas and oil a day. Being portable it has been placed on a truck and transported from one plant to another as needed. Arriving at the plant the truck is stationed nearest the point of control and in 15 or 20 minutes



New light weight full Diesel shovel unit

the pumps are running. Under the steam power method it was necessary to warm-up a boiler two or three days before the pumps began working completely. About 125 feet of cable connects generator and pumps.

Factory Change

THE Jeffrey Manufacturing Co. has acquired the patent, manufacturing and merchandising rights on all equipment formerly made by Traylor Vibrator Co., Denver, Colo. The new Jeffrey-Traylor division will continue the manufacture of the mechanical and electrical devices taken over at Columbus, Ohio.

J. A. Flint, former vice-president of the Denver concern, is in charge of the new division.

Prospecting Drill Uses Magnesium Alloys

A NEW DIAMOND core drill is announced by the E. J. Longyear Co., Minneapolis, Minn. By using magnesium alloys in many stationary castings, weight has been kept very low, yet strength and drilling efficiency have been maintained, the manufacturer states.

Features of the drill include a swivel head with selection of feed gear sets giving feed ratios varying from 100 to 1300 revolutions per inch of advance in drilling, clutch and pump, and choice of air, electric or gas motor. The rated capacity of this drill is 250 ft. of 5/8 in. or 7/8 in. core.

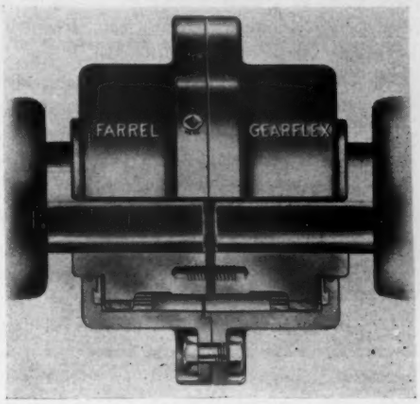
New Flexible Coupling

A FLEXIBLE coupling of the gear type has been introduced by the Farrel-Birmingham Company. This double engagement unit, called Gearflex, consists of two externally geared hubs keyed to the two shafts to be connected and engaging an internally geared floating sleeve which encases the two hubs.

With two sets of spur gears, one at each end of the floating sleeve, misalignment is compensated for by the sleeve assuming a neutral position between the two shafts. Thus, all whip or crank action is eliminated, says the company, relieving bearings and shafts of heavy pressures or vibration.

The large reservoir between the hubs and the floating sleeve carries the supply of lubricant. When the coupling rotates, centrifugal force throws the oil to the inner surface of the floating sleeve where it spreads between the gear teeth, entirely immersing the load-carrying surfaces in a bath of oil.

A single engagement type of this coupling has been designed to provide a lower cost coupling for applications where the high speed capacity and the high degree of flexibility of the double engagement type is not required. Both types are available in a number of standard sizes and power ratings.



Double engagement coupling

Lead Lubricant

A NEW lubricant has been developed in which metallic lead is the protective element. The lead has been broken down, it is said, into such finely divided parts as to be virtually a soluble or liquid lead within a lubricant vehicle. The new product, Bestolife, forms a thin protective film of lead on all contacting surfaces which changes such surfaces to a continuous unbroken, anti-frictional area, according to the manufacturers, Armite Laboratories of Los Angeles.

The lubricant has a pure metallic lead base instead of lead salts and is said to be free from chemical reactions. Minimum constituency of lead in it is 10%, ranging up to 65%, and is claimed to withstand temperatures up to 430° and will not entirely lose its lubricating stability until the melting point of lead is reached, which is 590°.

Agitator

AN addition to the line of agitators, mixers and stirrers manufactured by The Patterson Foundry and Machine Co. is identical with that used for several years with Patterson machinery. It is now offered as a separate unit. It is built in both vertical and horizontal types and, when using 1800 r.p.m. motors, will produce shaft speeds down to less than one revolution per minute if desired, without the use of gears, according to the manufacturers.

While it is claimed that one way or two way agitation can be accomplished without noise, vibration or grease slop of any kind, and heavy, continuous loads or momentary overloads as high as 400% can be carried, the unit is compact and light, making it adaptable for installation over tanks and vats.

Operating Scraper

PREPARING a new quarry section for actual excavating work is often tedious and expensive unless modern equipment is used to speed up the preliminary operations.

How such work can be handled quickly and economically is indicated by the accompanying illustration. The top soil above this limestone quarry near Bloomington, Ind., is scaled off efficiently by the use of one of the new Model K tractors of the Allis-Chalmers Manufacturing Co., and a tumble bug. This unit is designed particularly to negotiate sharp grades and rocky surfaces.

Tractor and tumble bug scraping quarry top soil

Rock Products News Briefs

Silica

Silicosis and **Silicatosis** are the subjects of a comprehensive symposium in *Industrial Medicine* for July. Dr. Carey P. McCord, medical director, The Industrial Health Conservancy Laboratories, Cincinnati, Ohio, in an article, "Silicates and Silicatosis" summarizes present medical knowledge as follows:

1. All silicates long taken into the lungs in the form of dust, of particle size capable of passing the cellular membranes, are likely to induce some fibrosis in excess of normal. This fibrosis may be unaccompanied by disability.

2. For concentrations of silicate dust, equal to silica in free form, a longer time (with few exceptions) is required for the production of definite fibrosis.

3. Using the quantity of silica dust regarded as harmful as a standard, grossly excessive amounts of some silicates in dust form may be borne for considerable length of time without disability.

4. Extensive fibrosis from silicates is unaccompanied by the same degree of disability (with possible exceptions, see 5 below) likely to arise from the same degree of silicotic fibrosis. It is equally true that progress of silicatosis is made at not nearly so rapid a rate as for silicosis.

5. Magnesium silicate, in the form of asbestos, appears to be an exception to the general expectancy of silicate action on pulmonary tissues. Asbestos dust appears to simulate silica, rather than silicates, with respect to the extent of lung injury and the time required to carry out this harmful action. "Asbestosis," as a descriptive term, appears to be justified, in that certain peculiar features set this form of pneumoconiosis apart from others now known. The X-ray findings in asbestosis are not identical to those from silicosis, and in some measure permit of differentiation.

6. The term "silicatosis" has come into no wide use, and later may be rated as undesirable. At the present time favor should be extended to the use of "pneumoconiosis" rather than the unduly cumbersome form "pneumonoconiosis" as a general term embracing all dusty lung diseases.

7. Most silicates exist in nature, and to some extent under industrial conditions, as mixed or complex forms. It is not unusual for silica and silicates to coexist. It is possible that silicosis and silicatosis may coexist.

8. The X-ray findings in silicatosis are dissimilar to those of silicosis. Clear cut distinction is, however, not always possible.

9. In some silicates the combination of divers constituents is essentially physical rather than chemical. This, if thoroughly established, means that the silica exists in free form as a shell or core of the chemical compound. In theory, at any rate, true silicosis may arise from silicate dust.

10. Admixture of some silicate dusts with free silica may retard the action of the silica. Deliberate mixtures of other dusts, preferably non-siliceous, with silica may become practical in some operations.

11. Tuberculosis rates are high in silicate-using industries. Antecedent tuberculosis, however quiescent, may flare up as a result of exposure to silicate dust.

12. In general, it may be maintained that silicate dusts are harmful, and may lead to a fibrosis of lung tissues, but on comparison with silica the magnitude of hazard is low, with asbestos in the leading position and providing an appreciable deviation from the common tendency.

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Defense of Silicosis Suits by producers is suggested in an editorial in the same issue of *Industrial Medicine* which is printed entire in the following paragraphs:

"The number of damage suits because of alleged silicosis has increased to such proportions that the future existence of not a few industries has been jeopardized. Apparently the real causes for this situation have been the unemployment problem, and the ill advice given to former employes in dusty trades by persons grossly ignorant of real issues, and the prostitution of the medical and legal sciences purely for the purpose of personal aggrandizement.

"Although not all such claims are valid, it is obvious that the real proof of validity rests upon the use of reasonable medical evidence. In spite of this, there are instances of attempted industrial defense where counsel has had the temerity to conduct a hearing without the introduction of medical testimony. The fallacy of such a practice is evident.

"Clearly if the claimant does not have silicosis, based on the presentation of reasonable medical evidence, he is not in a position to prove his allegation. This principle is most important and is many times entirely overlooked in the pressure of activity.

"Perhaps the chief cause of the failure of the defense in cases which have no scientific basis in fact is the lack of sufficient preparation, which is most prominently reflected in the use of incompetent medical advice and 'rushing' the collection and consideration of medicolegal evidence.

"Coordination between legal and medical counsel is most important—each must have ample time for consultation and planning—expert industrial physicians should be engaged thoroughly to explain the medical aspects of the case to the attorneys in such a way that there can be no misunderstanding—no point even of seeming minor importance should be neglected.

"The manufacturer must see to it that he obtains the best legal and medical talent available—being penny wise and pound foolish may be fatal to the economic life of his plant.

"The survival of certain of the manufacturing groups is quite likely dependent upon following through these stated principles, combined with a stubborn and consistent insistence upon justice."

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Texas Production Co., Tahoka, Tex., is reported to have begun construction of a silica mining and refining plant. V. S. Castle is manager. The silica is in the form of volcanic ash.

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Phosphate Rock

A new method or process of treating phosphate rock may greatly increase its use for fertilizer, say chemists of the United States Department of Agriculture. The experiments have been conducted by the Bureau of Chemistry and Soils and the chemists are hopeful the process can be adapted commercially, resulting in cheaper phosphate fertilizers for farmers. The new method, as described, is a radical departure from that now used to prepare super-phosphate, the principal phosphate fertilizer manufactured in this country. In the Government's experiments, raw phosphate rock was treated with water vapor and silica at a high temperature, thus driving off the fluorine. The phosphate rock is then ground.

The fluorine recovered is valuable. It is one of the most reactive of chemical substances—so reactive that chemists have found great difficulty in obtaining and preserving it in the free state. Some of the fluorine salts, however, particularly the fluosilicates of barium, magnesium, and sodium, are used for a variety of agricultural, industrial, and technical purposes—the control of insect pests; for the preservation and hardening of concrete; the treatment of rubber latex; in manufacture of glass and enamels; in refining of lead and antimony; and in the laundry. The department chemists estimate that a ton of phosphate rock contains approximately 80 lb. of fluorine, a portion of which can be and is being recovered as a by-product of the manufacture of superphosphate fertilizer. Inasmuch as more than 2,000,000 tons of phosphate rock are normally used annually for the manufacture of superphosphate in the United States, there is an ample supply of fluorine for insecticidal and other purposes. Recent investigations in the department laboratories have shown that by the calcination of phosphate rock in the presence of water vapor at high temperatures the fluorine can be removed and recovered.

THE INDUSTRY

New Incorporations

Halquist Lannon Stone Co., Lisbon, Wis., to quarry building stone. One hundred shares no par value. John, Minnie and Albin Clarence Halquist are the incorporators.

Smith and Harrington Co., Marseilles, Ill., to sell sand and gravel and do a general contracting business. Harold B. Smith, Bruce J. Harrington and Della Balcucelli are the incorporators with 100 shares par value.

Ohio Limestone and Portland Cement Co., Ironton, Ohio, was incorporated with a capitalization of $150,000 and 500 shares of no par value with H. J. Hill and H. J. Paxton of Detroit, and Judge E. E. Corn of Ironton named as the incorporators.

Passaic County Quarry Co., Paterson, N. J. Quarrying. 1,000 shares no par.

Keystone Gravel Co., Dover, Del. To carry on a sand and gravel business. $95,000. 2,000 shares no par value.

Lynn Gravel Company, Inc., Avalon, Miss., capital $5,000 common.

Shenandoah Sand and Gravel Corp., Staunton, Va., has been incorporated for $15,000 to conduct a general sand and gravel business.

Standard Lannon Stone Co., Milwaukee, Wis., has been incorporated for $25,000 to deal in stone and marble of all kinds. Harold B. Panetti, Martha Schattschnieder and Charles B. Babcock are the incorporators.

Jamison Black Marble Co., Inc., Roanoke, Va., Capital $15,000; John C. and Paul H. Jamison.

Eureka Mining Co., Eureka Springs, Ark., is being incorporated by Jacob S. Coxey of Massillon, Ohio, and James M. Sharkey of Chicago, Ill., to develop 400 acres of silica deposits near Grandview.

Sand and Gravel

Greenville Sand and Gravel Co., Greenville, Miss., has resumed operation under N.R.A. provisions. More than 15 extra workmen are employed on a 40-hour week.

George H. Smith and Sons, gravel and sand wholesalers, Gary, Ind., have filed a voluntary petition in bankruptcy.

Missouri Gravel Co. has opened a new plant at Barry, Ill.

Douds Stone Co., Bonaparte, Ia., has opened a new gravel pit southeast of Farmington. H. E. Millen is superintendent.

Birnie Sand and Gravel Co., Springfield, Mass., has reopened its plant due to increased activities in highway construction and other public works.

R. T. Schlueter has opened a gravel pit near Roseland, Neb.

Dixie Sand and Gravel Co., Inc., Jackson, La., has filed notice of dissolution at Baton Rouge.

Gravel plant near Enterprise, Ohio, has been opened and will be operated by county commissioners.

Costain gravel pit operators near Parker, S. D., have installed a new rock crusher.

Verne Wardman gravel pit near Union, Hardin county, Ia., recently the source of a prehistoric hairy mammoth fossil, also now is credited with another excavation relic: a large elk antler.

Quarries

Limestone Quarries, Martinsburg, W. Va., have announced a 15% wage increase affecting nearly 1,000 workers.

Orcas Lime Co., San Juan Island, near Friday Harbor, Wash., has taken over property and equipment formerly run by J. Dally of Seattle.

T. L. Durocher Co., property on Drummond Island containing approximately 20,000,000 tons of rock, is scheduled for public auction, September 26, by K. E. Wicks, master in chancery, Grand Rapids, Mich.

Limestone deposits at Banks and Weiser, Ida., are involved in negotiations under way at Middleton for a fertilizer plant, sponsored by Coffin and Wakeland of Star, Ida.

W. S. Cox and Son have installed another crusher at their quarry south of Fayette, Mo.

Peterson Construction Co., Minneapolis, Minn., has leased the Martin rock quarry, two miles north of LaGrange, Mo.

Kirkwood Township quarry, near Bellaire, Ohio, has been closed, pending settlement of a dispute between the county officials and the operator.

Royal Granite Co., Saint Cloud, Minn., has purchased land near Mellen, Wis., and will start quarrying operations at once on black granite deposits.

Limestone quarry equipment has been moved to a new section of Tama county, Ia., by county operators using the product for road-resurfacing.

Cement

Petoskey Portland Cement Co., Petoskey, Mich., plans mill extensions and improvements to cost $25,000 including equipment.

Pennsylvania-Dixie Cement Corp. has closed its plant at Des Moines, Ia., temporarily.

Federal Portland Cement Co., Inc., Buffalo, N. Y., plans the reopening of its $2,000,000 plant which has been idle since 1931. "General pick-up in the cement business due to industrial improvement" is given as the reason for resuming operations.

Medusa Portland Cement Co., plant Bay Bridge, Ohio, has been closed temporarily.

Hermitage Portland Cement Co., Nashville, Tenn., announces the addition of 16 employes under N.R.A. code provisions, an increase of 16%. The payroll has been increased 40%.

Nebraska Cement Co., since reopening of its plant in Superior, Neb., reports a 25% increase in number of men employed and a 33⅓% increase in payroll.

Cowell Portland Cement Co., Concord, Calif., plant has recalled 200 men for renewed operations.

Universal Atlas Cement Co., in announcing wage changes for its plant at Independence, Kan., made the general 15% raise retroactive from July 16.

Great Lakes Portland Cement Co., Buffalo, N. Y., is paying the same wages practically for the present 42-hour week as for the old 48-hour schedule. Payroll names have increased 40%.

Oregon Portland Cement Co.'s plant near Roseburg, Ore., closed since last November, recently reopened on a 36-hour week basis.

Santa Cruz Portland Cement Co.'s plant at Davenport, Calif., is operating on a 36-hour week with men receiving the same weekly wage as they formerly did for a 48-hour week.

Miscellaneous

American Potash and Chemical Corp., New York, N. Y., announces plans for additions to its plant at Trona, Calif., for manufacture of soda ash, salt cake, etc. Cost will be over $1,000,000 for the group of one and three story units with equipment.

N. C. Amen and A. J. Hamilton, operating one of the three talc mines in California, expect an output of 20 tons per day by October 1 from the mine near Ione. The talc will be ground and sacked at the mines, trucked to Sacramento.

Cleveland Mica Co. has installed factory equipment at Berea, Ohio, in property which it has leased for three years.

Fuller's earth deposits in the lowland area of southeast Missouri are being investigated by Missouri Geological Survey workers.

Davidson county mine operators in Tennessee have made an initial shipment of 100 tons of barite to establish the commercial value of deposits.

Muscovite Mica Mining and Milling Co., with its properties near Guernsey, Wyo., has distributed samples of mica and anticipate commercial production of this product, according to President Wilenchick of Salt Lake City.

Diatomaceous earth products in the Upper Newport Bay, Newport, Calif., are to be developed commercially by producers of waterproof cement and other products in which diatomaceous earth is used.

Cement Products

Baltimore Concrete Products Co., Baltimore, Md., is constructing an addition to its plant 40 × 80 ft., of concrete block construction.

Acme Stone Co. plant, Minneapolis, Minn., was destroyed by fire, September 6. The establishment had been used for the manufacture of concrete products.

Concrete contractors at Great Falls, Mont., co-operated in the recent completion of one of the largest outdoor concrete swimming pools in the northwest. The pool is 204 × 150 ft. and varies from 3 to 9 ft. in depth. Nearly 1,000,000 gal. of water were required to fill it.

Personals

Seichi Watanabe and Euchi Shimizu, representatives of the Onodo Cement Co., Onodo, Japan, recently inspected cement mills at Cape Girardeau, Mo. They return to Japan this month.

John Catto, Jr. has been elected a vice-president of the Republic Portland Cement Co., San Antonio, Tex.

Everett H. Nelson suffered leg fractures in a gravel cave-in pit near Pine Creek, Ia.

J. J. Scherr, formerly sales manager for the International Portland Cement Co., has associated himself with Charles S. Clute in the asphalt contracting business at Spokane, Wash.

Obituaries

John A. Burke, vice-president and general manager of the New England Concrete Co., Boston, Mass., died recently in an automobile accident.

Frank P. Monaghan, 51, general manager and a director of the Glens Falls Portland Cement Co., Glens Falls, N. Y., died September 18. He was formerly with the Alpha Cement Co.

John J. Ball, 71, native of Rio de Janeiro, Brazil, organizer of the Big Rock Stone and Construction Co. and the Ball-Benton Gravel Co., also the Malvern Gravel Co., died at his home in Little Rock, Ark., September 13. At the time of his death he was interested financially only in the Arkansas Sand and Gravel Co.

Charles A. Angell, director of the A and H Granite Co. and president and director of the Automix Concrete Co., died at his Shelter Island home, August 26. His winter residence was in Brooklyn, N. Y.

Walter Manegold, 54, vice-president of the Wauwatosa Stone Co., died August 29 in Milwaukee, Wis.

Robert G. Bear, treasurer of the United States Gypsum Co., died suddenly September 10 at his home in Evanston, Ill. He was formerly purchasing agent for the Lehigh Portland Cement Co.

John S. Lovell, treasurer of the Massachusetts Sand and Gravel Co., died at a driving club in Brighton, Mass., September 9, after he had completed a training session behind one of his famous trotting horses. He had been a resident of Watertown, Mass., for 48 years.

Warren A. Bechtel, president of Six Companies, Inc., and head of the Bechtel-Kaiser Co., Ltd., died in Moscow, U. S. R. R., recently, due to an overdose of medicine. Mrs. Bechtel, who had accompanied him to Europe, was in Vienna at the time of his death.

Dr. Ephraim Noble Lowe, 70, state geologist for Mississippi during the last 25 years and head of the geological department in the University of Mississippi at Oxford, died September 12.

Manufacturers

Alemite Corp., Chicago, Ill., announces removal of its offices to 1828 Diversey Blvd.

Juhass and Mencher, New York, N. Y., patent attorneys, announce removal of their offices to 55 West 42nd St.

Joseph T. Ryerson & Son, Inc., Chicago, Ill., has appointed R. B. Wilson as manager of its plant in St. Louis, Mo.

Stein-Brill Corp., New York, N. Y., announces removal of its New York offices and warehouses to 183 Varick St.

W. W. Sly Manufacturing Co., Cleveland, O., has appointed Fred E. Wolf as sales engineer for the Pittsburgh district.

B. F. Goodrich Co., Akron, O., announces an average advance in tire prices, effective June 7, averaging 8 to 9 per cent.

Gunitor Co., Elkhart, Ind., announces new line of machines for pneumatic application of cement, concrete and refractory materials.

Chicago Pneumatic Tool Co., from its New York office announces the opening in September of a new branch office in Seattle, Wash.

Ludlow Valve Manufacturing Co., Troy, N. Y., has appointed the J. W. Frazier Co., Cleveland, O., as its representative in northern Ohio.

Union Carbide Co. offers a diorama of its plants and miniature models of welding and cutting outfits at its World's Fair display in Chicago.

Interstate Equipment Corp. announces removal of headquarters from 25 Church St., New York, N. Y., to 18 West Jersey St., Elizabeth, N. J.

Joseph T. Ryerson & Son, Inc., Chicago, Ill., has appointed W. F. Kurfess, former manager of its mill department, assistant vice-president.

Babcock & Wilcox Tube Co., Beaver Falls, Penn., announces L. E. Jeanneret as acting district sales manager of the company's Detroit territory.

Westinghouse Electric and Manufacturing Co., Pittsburgh, Pa., has appointed J. M. Hipple as general manager of its merchandising engineering.

Lincoln Electric Co., Cleveland, O., will continue to operate its welding school full time. Four weeks is the length of the arc welding course offered.

Pierce J. McAuliffe, representative of the Morris Machine Works and Pomona Pump Co., announces removal of New York, N. Y., office to 254 West 31st St.

Toledo Scale Co. announces the opening June 15 of an exhibit of practical research at its Chicago office in connection with the Century of Progress exposition.

Johnson Corp., Three Rivers, Mich., has acquired the line of Gast air separators, aftercoolers, oil absorbers, etc. R. O. Monroe has been appointed sales manager.

Link Belt Co., Chicago, has moved the purchasing department of its Caldwell-Moore plant to 300 West Pershing road. All purchasing is under supervision of H. M. Coen.

Newhall Chain Forge and Iron Co., New York, N. Y., announces the election of Harry C. Brown, former vice-president, as president to succeed the late Henry B. Newhall.

Worthington Pump and Machinery Corp., Harrison, N. J., continues its New York City sales office at 2 Park avenue, after removal of general offices to its new building in Harrison.

Scoville Manufacturing Co., Waterbury, Conn., has been licensed by the Dardelet Threadlock Corp. to manufacture and sell bolts and nuts with the Dardelet self-locking thread.

Chain Belt Co., Milwaukee, Wis., has appointed the Superior United Corp., distributors for the complete line of Rex construction equipment in the Chicago district and state of Indiana.

Brown-Bevis Co., Los Angeles, Calif., has been sold to Walter Parsons, former general manager; J. A. Beynon, C. M. Weinberg and B. G. Rhodes. Business is being continued without interruption.

Four Wheel Drive Sales Co., Clintonville, Wis., has announced the appointment of A. J. Steffick as district sales supervisor for the States of Utah, Idaho, Montana, and the Yellowstone park district.

Inland Products Co., Detroit, Mich., announces the development of Rustarest to serve as a priming coat for metal surfaces. Extraordinary bonding quality is claimed for this new rust preventive.

Dardelet Threadlock Corp., New York, N. Y., has licensed the General Electric Co. and its subsidiaries to manufacture for their own use, bolts, nuts and other threaded parts under the Dardelet patent.

Kron Co., Bridgeport, Conn., has appointed the following distributors: Equipment Engineering Co., New Haven, Conn.; R. S. Kerr and Co., Atlanta, Ga.; Equipment Engineering Co., Indianapolis, Ind.

Worthington Pump and Machinery Co., Harrison, N. J., has consolidated its production and sale of meters with those of the Gamon Meter Co., through the newly organized Worthington-Gamon Meter Co.

Tyson Roller Bearing Corp., Massillon, Ohio, announces E. Phillips as sales engineer in charge of mine car anti-friction bearing applications. He was formerly connected with the Timken Roller Bearing Co.

Speeder Machinery Corp., Cedar Rapids, Ia., recently appointed the H. O. Penn Machinery Co., New York, N. Y., as its dealer in the New York metropolitan area and New Jersey for ½ and ⅜-yard sizes of Speeder shovels.

The Industrial Chemical Sales Co., Inc., New York, N. Y., manufacturers of Nuchar activated carbons, opened branch offices July 10 at 370 West Broad street, Columbus, Ohio. Richard N. Statham, formerly assistant manager of the Chicago office, is in charge.

Lewis-Shepard Co., Boston, Mass., announces the appointment of George H. Corliss as sales promotion and advertising manager for its line of industrial material handling equipment. Formerly Mr. Corliss was with the J. A. Fay and Egan Co., Cincinnati, Ohio.

Coppus Engineering Corp., Worcester, Mass., because of a "marked pick-up in New England business" has appointed Frederick D. Rogers, Boston representative, to handle sales in Maine, New Hampshire, Vermont and the section of Massachusetts lying east of Worcester County.

Whitcomb Locomotive Co., Rochelle, Ill., subsidiary of the Baldwin Locomotive Works, has been awarded by the Metropolitan Water District of Southern California a contract to furnish 12 eight-ton electric storage battery locomotives to be used in the building of the Coachella tunnels in California.

E. F. Houghton and Co., Philadelphia, Pa., announces election of Major A. E. Carpenter as general manager, George W. Pressell as assistant general manager and director of sales, Dr. R. H. Patch as treasurer, A. E. Carpenter III as secretary. Louis E. Murphy continues as president.

Raymond Bros. Impact Pulverizer Co., Chicago, extends an invitation to visitors at the Century of Progress industrial exhibits to inspect the air-drying pulverizer at its plant, 1315-25 North Branch street. A Raymond kiln mill is part of display at the Museum of Science and Industry in Jackson Park.

General Electric Co., Schenectady, N. Y., announces removal of its New York city office to the new General Electric Building, 570 Lexington Avenue. New York city headquarters formerly at 120 Broadway involved the occupancy of three whole floors for 15 years. Approximately 50% of the new building is occupied by the company's offices.

Bay City Shovels, Inc., Bay City, Mich., announce complete specifications on its new 10-ton crane, available with clamshell, dragline or trench hoe buckets in addition to shovel. It is offered as Model 42 standard ¾-yd. machine. Anti-friction bearings and helical cut gears are used throughout. Working weight as a shovel is approximately 41,000 lbs.

B. F. Goodrich Rubber Co., Akron, O., has appointed Lucien Q. Moffitt, Inc., exclusive distributors for Goodrich cutless rubber bearings in the United States and Canada. Lucien Q. Moffitt, who has been manager of the rubber bearing department of Goodrich since this new development in water-lubricated bearings was first placed on the market several years ago, heads the new distributor company.

Iowa Manufacturing Co., Cedar Rapids, has appointed distributors as follows: J. C. Corrigan Co., Boston, Mass.; J. Shuman Hower, Utica, N. Y.; Charles S. Porter Supply Co., Huntington, W. Va.; Interstate Machinery Co., Omaha; Bublitz Machinery Co., Kansas City, Mo.; Henry D. Petter Supply Co., Paducah, Ky.; Carolina Contractors Equipment & Supply Co., Columbia, S. C.; and Contractors Service, Inc., Charlotte, N. C.

Cummins Engine Co., Columbus, Ind., announces dealer connections for its Diesel unit with D. C. Elphinstone, Inc., Baltimore, Md.; Equitable Equipment Co., New Orleans, La.; Brandeis Machinery and Supply Co., Louisville, Ky.; F. C. Richmond Machinery Co., Salt Lake City, Utah; Southern Machinery and Supply Co., Roanoke, Va.; Worthington Machinery Corp., Tulsa, Okla., and Austin-Western Road Machinery Co., Chicago, Ill.

E. I. Du Pont de Nemours and Co., Wilmington, Del., announces the reorganization of its explosives department as follows: William H. Ward, formerly assistant director of sales, as director of sales; P. J. Kimball, formerly New York office manager, as assistant director of sales; H. W. Hobson, assistant director of sales; S. M. Nelson, transferred as manager to New York office; J. Clark Davis as manager of Pittsburgh office. E. F. Carley is manager of the explosives department.

Atlas Imperial Diesel Engine Co., Oakland, Calif., has appointed F. H. Dickson, well known in the Diesel engine industry, as manager of its central division. Mr. Dickson will maintain offices at 211 West Wacker Drive, Chicago, Illinois, directing the company's activities in the central states. Mr. Dickson is well known in the middle west, particularly in the sand and gravel industry. Atlas Imperial engines are widely used in the excavator and marine field. A recent bulletin on Diesel-driven portable air compressors should be of interest to quarry operators.

Trade Literature

Lubricants. Bulletin No. 130.6 deals with colloidal graphite as a high temperature lubricant. ACHESON OILDAG CO., Port Huron, Mich.

Compressors. Two-stage air-cooled compressors described graphically. Specifications for various sizes and types. INGERSOLL-RAND CO., New York, N. Y.

Diesel Engines. Four-page illustrated pamphlet gives comparative power costs as between steam and Diesel and electric and Diesel units. BUCKEYE MACHINE CO., Lima, Ohio.

Commutators. Bulletin describes manufacturing and repair service for all types and sizes of commutators and slip-rings. COLUMBIA ELECTRIC MANUFACTURING CO., Cleveland, Ohio.

Screw Conveyors. Data book No. 1289, 128 pages, illustrated, contain engineering data and listings on helicoid and sectional flight screw conveyors. A complete treatise. LINK-BELT COMPANY, Chicago, Ill.

Jaw Crushers. Complete data on standard and sectional jaw crushing equipment with instructions for erecting and operating Blake Crushers. No. 1451-F. ALLIS-CHALMERS MANUFACTURING CO., Milwaukee, Wis.

Crushers. Reduction Crusher (Type TZ) shown clearly by diagrams accompanied by complete table of specifications. Fourteen pages. Bulletin No. 2110. TRAYLOR ENGINEERING AND MANUFACTURING CO., Allentown, Penn.

Pumps. Sixteen-page catalog (Bulletin No. 240) presents theory of self priming pumps with graphic representation indicating pump action. Charts and tables for developing correct pump specifications. CHAIN BELT CO., Milwaukee, Wis.

General. Twenty-two different units of crushing, screening and washing plant machinery adaptable to rock products industries, illustrated and briefly described. Leaflet 2164. ALLIS-CHALMERS MANUFACTURING CO., Milwaukee, Wis.

Switches. Housing and contact mechanism of industrial switch factors. Illustrated. Measurements given. Six-page folder with supplement describing special type of motor starter. ELECTRIC CONTROLLER AND MANUFACTURING CO., Cleveland, Ohio.

Valves. 264-page catalog is source of information on valves and valve layouts, services, pressures, temperatures and fluids for which valves are recommended are stated. Full information concerning metals used in valve manufacture. JENKINS BROS., New York, N. Y.

Spiral Pipe. Riveters or welded spiral pipe described and its industrial application shown in a comprehensive 64-page catalog (No. 33). Supplemental data included such as hydraulic engineering records of pipe line carrying capacity, etc. TAYLOR FORGE AND PIPE WORKS, Chicago, Ill.

Dirt Remover. (Correction.) The 12-page booklet describing the hauling, dumping, spreading units of the KOEHRING CO., mentioned on page 83 of ROCK PRODUCTS for August 25, deals only with gasoline engine power units and do not involve electric power units as erroneously stated. NATIONAL EQUIPMENT CORP., Milwaukee, Wis.

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October 25, 1933

TABLE OF CONTENTS

Keeping Going with the Ordinary Stone and Lime Plant 17-19
(Contributed)

A New Cement Plant in Brazil 20-24

Notes on Screw Conveyor and Bucket Elevator Drives 25-27
By T. N. Haffner

Problems of Small Gravel Operation and How it is Proposed to Solve Them 28-29
By John H. Spicer

The Particle Analysis of Cement and Gypsum by Sedimentation 30-31
By Wallace C. Riddell

This Code is Now Law in the Lime Industry 42-44
By proclamation of the President, October 13, every lime manufacturer in the United States is bound by its provisions.

Progress with Precast Concrete Joist Floors for Residences 50-51
By R. E. Copeland

Departments

Chemists' Corner 30-31
Hints and Helps for Superintendents 32-33
Editorial 35
Financial News and Comment 36-37
Traffic and Transportation 38-39
Digest of Foreign Literature 40-41
Cement Products 50-51
New Machinery and Equipment 52-53
The Industry 55-56
Classified Directory of Advertisers 62-64

INDEX OF ADVERTISERS

A
Allis-Chalmers Mfg. Co.. 72
American Cable Co., Inc. .....Back Cover
American Manganese Steel Co. 66
American Steel & Wire Co. 1

B
Babcock & Wilcox Co.... 60
Bacon, Earle C., Inc..... 69
Bradley Pulverizer Co.... 65
Bucyrus-Monighan Co. .. 8

C
Chain Belt Co..... 68
Chicago Perforating Co... 69
Classified Advertisements 70–71
Classified Directory of Advertisers 62–64
Cross Engineering Co..... 65

E
Eagle Iron Works 68
Ensign-Bickford Co. 63

F
Fate-Root-Heath Co. ... 13
Frog, Switch & Mfg. Co. 68
Fuller Co. 6

G
General Electric Co..... 14
Goodrich Rubber Co., B. F. 58-59

H
Harnischfeger Corporation .....Inside Back Cover
Harrington & King Perforating Co. 66
Haynes Stellite Co..... 9
Hayward Company 68
Hendrick Mfg. Co..... .....Inside Back Cover
Hotel Lincoln 67

J
Jaeger Machine Co..... 65
Jeffrey Mfg. Co..... 7

K
Keystone Driller Company 10
Knickerbocker Company. 67

L
Leschen, A., & Sons Rope Co.....Inside Back Cover
Lewistown Fdy. & Mach. Co. 68
Lincoln Hotel 67
Link-Belt Co. 5

M
Macwhyte Company 3
Marion Steam Shovel Company ....Inside Front Cover
McLanahan & Stone Corp. 70
Morris Machine Works... 66
Morrow Mfg. Co..... 67

N
Nordberg Mfg. Co..... 68

O
Ohio Power Shovel Co.... 70

P
Pennsylvania Crusher Co. 69
Plymouth Locomotive Works 13
Productive Equipt. Corp.. 69

R
Raymond Bros. Impact Pulv. Co. 12
Robins Conveying Belt Co. 68
Roebling's, John A., Sons Company 15
Ryerson, Jos. T., & Sons, Inc. 69

S
S K F Industries, Inc.... 16
Smidth, F. L., & Co..... 61

T
Traylor Eng. & Mfg. Co.. 4

U
Union Carbide & Carbon Corp. 9
United States Rubber Co. 11
Universal Vibrating Screen Co.....Inside Back Cover
Used Equipment 70–71

W
Wellman Engineering Co. (G. H. Williams Co.)... 69
Wilfley, A. R., & Sons, Inc. 69
Williamsport Wire Rope Co. 57

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